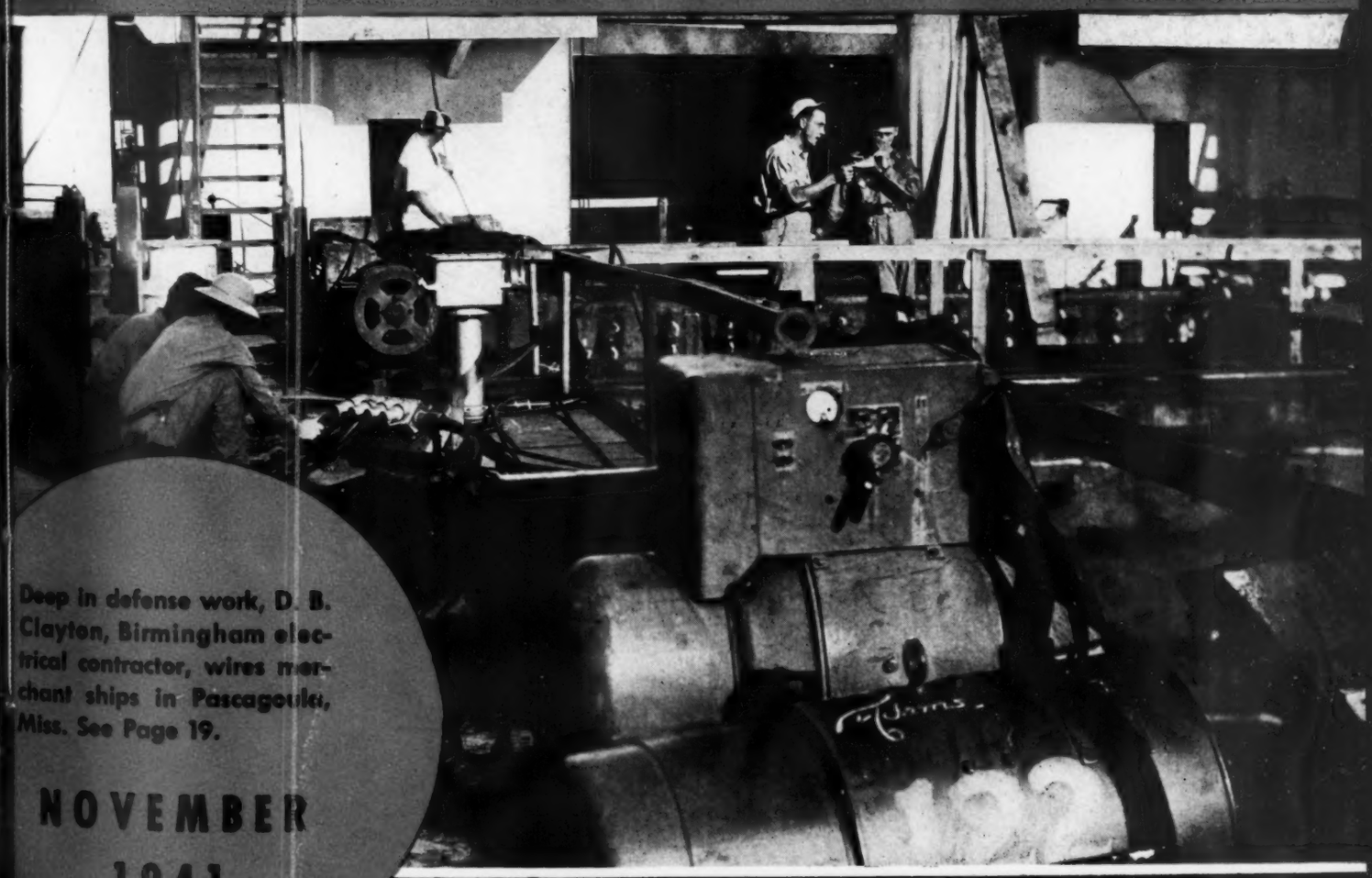
Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION



Deep in defense work, D. B. Clayton, Birmingham electrical contractor, wires merchant ships in Pascagoula, Miss. See Page 19.

NOVEMBER
1941

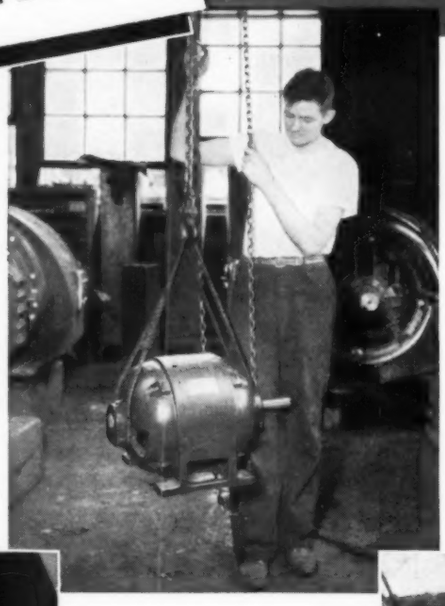
INDUSTRIAL ELECTRIFICATION SECTION PAGES 93 to 104

SEE HOW YOU SAVE TIME WITH THE TRI-CLAD MOTOR

REG. U. S. PAT. OFF.

Extra Convenience Features

help you get the Tri-Clad motor into service faster—keep it in service with less attention.



1. Easy to Handle

They can be moved into position easily because of their light weight and compactness. The shape of the bearing housings and the location of end-shield fittings make it easy to handle Tri-Clad motors with slings. In addition, they are sturdily built and do not have to be coddled.

2. Quickly Mounted or Altered

Their feet are machined accurately and drilled for standard mounting bolts. The reversible stator puts the roomy conduit box on the most convenient side and the end-shields can be rotated to any of four positions to meet mounting requirements.

3. Easy to Wire

A large, four-position conduit box gives unrestricted working space. It can be quickly removed for wiring. Flexible leads are pressed on the terminals which are permanently identified. No soldered connections are necessary. A stainless-steel, graphic connection plate is conveniently located on the conduit-box side of the motor

4. Convenient to Lubricate

All Tri-Clad motors have a large oil or grease capacity. On sleeve-bearing motors, the oil-filler gage can be located on either side of the bearing housing. A spring cover on this gage permits quick checking of the oil level. On ball-bearing motors, a pressure-relief greasing system assures rapid and thorough greasing.

BUILT FOR PROTECTION FIRST . . . TO LAST

Extra Protection 3 Ways

HELPS ASSURE LONG SERVICE LIFE

Production interruptions are avoided and operating time is saved when the motor you buy can stand up under the many adverse operating conditions commonly found in industry. Tri-Clad motors meet these conditions with—

1. *Extra Protection* against physical damage
2. *Extra Protection* against electrical breakdown
3. *Extra Protection* against operating wear

The new General Electric Tri-Clad motor is a cinch to install. Its convenience features pay off in precious minutes saved—both for those who build motors into machines and for those who use them in a plant.

Next time you order motors, take *time-saving* into account, along with protection and performance; make sure you get Tri-Clad motors—now available in a wide range of types and integral horsepower sizes to 20 hp.

Write for Bulletin GEA-3580 which gives full details about these extra protection features and other Tri-Clad motor advantages.

GENERAL ELECTRIC

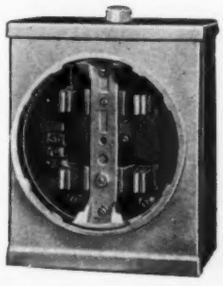
250-51-8058

POSITIVELY

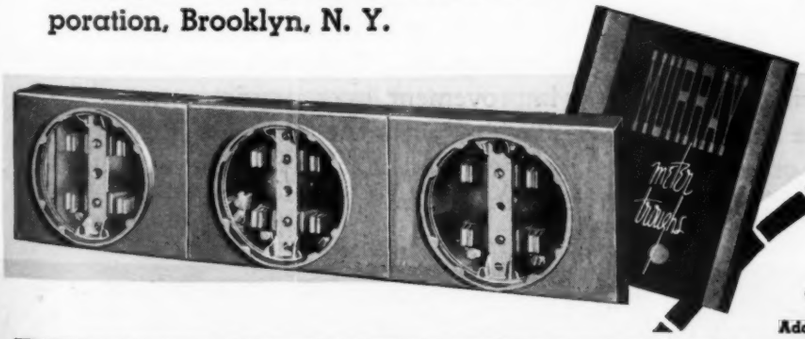
YOU NEED TO HANG

ndeed — there's no machine shop needed to hang Murray Troughs . . . whether for socket-type meters or others. Everything is made so simple and easy for you, that even the most complicated installation is like rolling off a log. And *that* means more profit for you. Ask any contractor who's a real friend and he'll give you his success secret. It'll be — "Hang Murrays!" Metropolitan Device Corporation, Brooklyn, N. Y.

meter troughs



Independent *units* of one, two, three or four can be used separately or in any combination to make troughs of any desired length. All fitted with Murray Solderless Connectors for quick, positive wiring.



METROPOLITAN DEVICE CORPORATION
Brooklyn, N. Y.

Gentlemen: Please send me—free of cost or obligation—my copy of "Murray Meter Troughs."

Name _____ Title _____

Company _____

Address _____

ELECTRICAL CONTRACTING, Published monthly, price 25 cents a copy. Vol. 40, No. 11. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription Rates—U. S. A., and Latin-American Republics, $2.00 a year, $3.00 for two years, $4.00 for three years. Canada $2.50 a year, $4.00 for two years, $5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries $3.00 a year, $6.00 for three years. Entered as second-class matter August 20, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1941, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

this OK—

GROWS LOUDER EVERY YEAR

No SAG OR TWIST IN
CS MOTOR FRAMES
8 REASONS WHY YOU SHOULD BUY WESTINGHOUSE INDUCTION MOTORS
We said this and proved it in 1933
350 pounds of man—hanging 3½ feet out from this 10-hp. motor bearing—and it sagged less than 2/10,000 of an inch!
Westinghouse

Industry approved the one-piece Westinghouse frame in 1933—and likes it better than ever today

"No sag or twist in CS Motor Frames" is an old story by now. We said it in 1933—and proved it by letting a 10-hp motor bearing support 350 pounds, 3½ feet out from the frame.

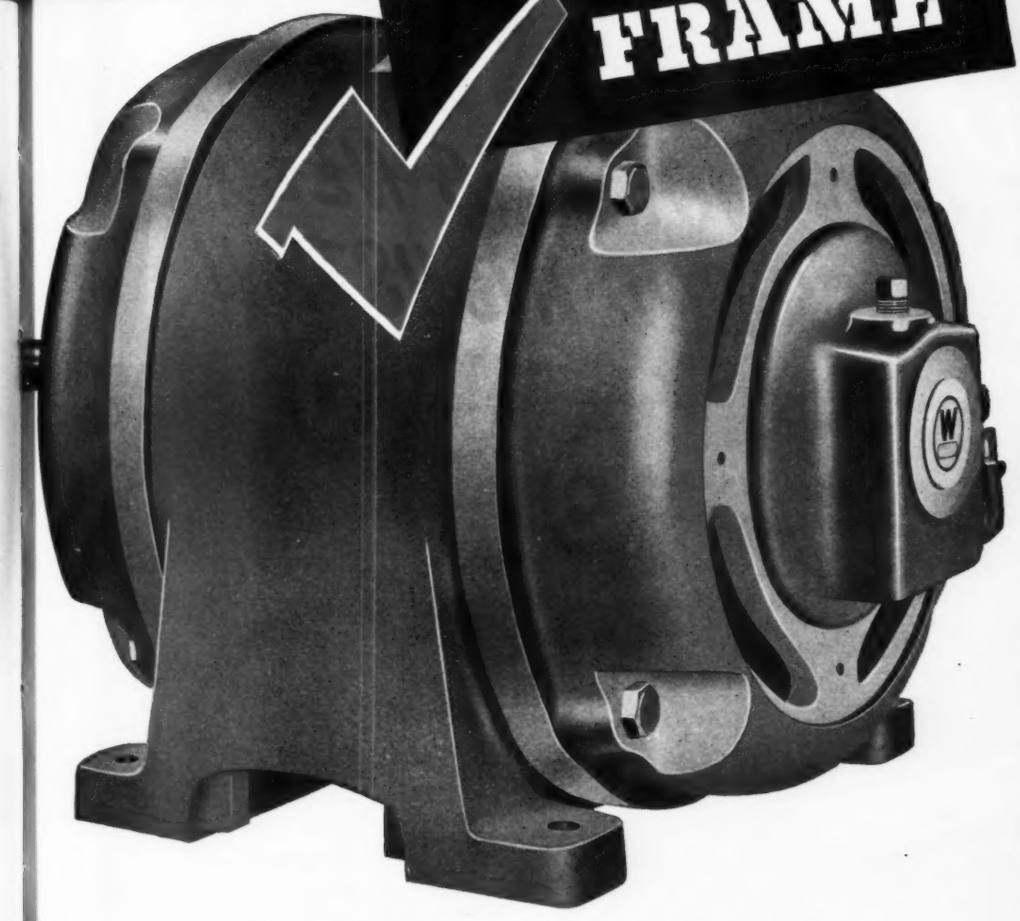
Industry liked the idea then—and ordered CS Motors to get the benefit of a rigid cast frame, along with those other important benefits—sealed-sleeve bearings and Tuffernell insulation.

Industry likes the idea better than ever today—judging by the acceptance of the one-piece cast frame.

When we first announced it over a decade ago, the CS Motor with its cast frame, sealed-sleeve bearings and Tuffernell insulation was a big improvement over previous motor designs. Today, with the years of experience and improvement that have gone into it, it is better than ever.

Westinghouse

ONE PIECE FRAME



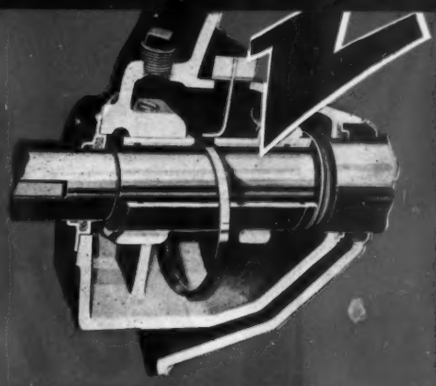
The integrally cast frame on this Westinghouse CS Motor protects the electrical elements fully against twisting strain and vibration.

RENEWAL PARTS AND SERVICE

Not only for current models, but for any Westinghouse Motor or control device ever built, Westinghouse assumes the responsibility of providing renewal parts. They are made with the same tools as the original equipment and to the same rigid standards. Parts are therefore fully interchangeable and maintain the original performance.

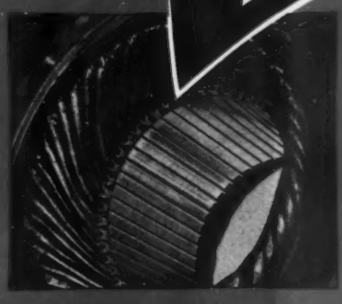
The 34 district manufacturing and repair plants are so located throughout the United States that parts or service are available overnight wherever your plant may be.

J-21175



SEALED-SLEEVE BEARING WITH FELT GASKET AND VESTIBULE SEAL

Oil is sealed in—dirt and dust are sealed out. Only in Westinghouse CS Motors do you get this dual protection.



TUFFERNELL INSULATION

Includes the Westinghouse insulating slot cell, plus taped end turns giving extra strength at the most vulnerable spots. The final dipping and baking completes the protection which resists the abrasive wear of dust, dirt, and grit under the most unfavorable conditions.

HIGH FREQUENCY TEST GIVES EXTRA PROTECTION AGAINST INSULATION FLAWS

In addition to the standard A.I.E.E. tests each Westinghouse motor must pass the Westinghouse Radio Frequency Test—the only test that detects flaws and weak spots between each individual turn of the windings.

Type CS Motors

GUTH FLUORESCENT
FOR EVERY LIGHTING NEED IN BUSINESS AND INDUSTRY!

GUTH Fluorescent Luminaires are scientifically engineered — carefully designed — and extremely well built to deliver a real job of lighting wherever they're used! Backed by more than 39 years of experience in the lighting field, GUTH Fluorescent is *dependable* — the kind of merchandise you *like* to push!

Symbol of the Amazing Performance of GUTH Fluorescent

Guth Fixtures are styled for beauty *and* efficiency —you have *extra* attractiveness and *extra* illumination wherever you SELL GUTH FLUORESCENT! There are GUTH Luminaires ideally suited to every commercial and industrial need. Whatever the job, think of GUTH first, and you're sure of having a satisfied customer! Our Engineering & Layout Service Department is at your disposal—no obligation. Thousands of business men confirm our judgment that GUTH Fixtures are, "Fluorescent Lighting's ONE Best Buy!"

THE EDWIN F. GUTH COMPANY
2615 Washington Avenue St. Louis, Mo.

Guth

"LEADERS IN LIGHTING SINCE 1902"

FACTS YOU CAN USE TO SELL MORE AND BETTER WIRING JOBS

FIRST . . . Measure All Three!

CODE WIRE
TYPE R

Meets all "code" requirements but is limited to 50° C. operation.

PERFORMANCE
TYPE RP

This better grade insulation permits operation at 60° C. Carries heavier current loadings or allows use of smaller size conductors.

HAZARD PERFORMITE
TYPE RH

A superior insulation in every respect. Operating temperature 75° C. Permits still greater current loadings or even smaller conductors. Performite is super-aging . . . resistant to heat and moisture . . . lasts indefinitely . . . meets Federal Specs. J-C-106-a and J-C-121.

SECOND . . . Compare Typical Wiring Costs of All Three!

Conductor Size A W G	Carrying Capacity in Amperes 3 Cond. 30 Ambient			Relative Cost* per 100 Amp. — ft. (IAEI Bulletin, Jan. 1941)		
	Type R	Type RP	HAZARD Performite Type RH	Type R	Type RP	HAZARD Performite Type RH
2	80	96	115	$.867	.770	.670
4/0	160	193	230	$.970	.870	.740

**Naturally if the full carrying capacity of the conductors is not available because of excessive voltage drop, the comparison will have to be modified proportionately.*

WITH ALL ITS ADVANTAGES . . . HAZARD PERFORMITE COSTS LESS PER AMPERE CARRIED

There are the facts! Relative costs figured from actual installations show that even the first cost of HAZARD Performite is actually less than Type R wire in a great many cases. This is true because this superior insulation permits greater load carrying or makes it possible to use smaller conductors for the same load. Both ways bring important copper savings and add materially to the life of the circuit.

For full information on HAZARD Performite, Type RH or Type RHT (small diameter for new wiring and rewiring), WRITE TODAY.

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE COMPANY
Works: Wilkes-Barre, Pennsylvania
Offices in Principal Cities

HAZARD
PERFORMITE TYPE RH

Ready Wired COMBINATIONS

Real Time-Savers for Installers and Users

ONCE you've chosen Bryant Ready Wired Combinations, you'll agree with thousands of others that installation is fast and easy. Users praise them because needless "plug pulling" is avoided, appliance cords last longer, and time is saved.

Dependable high-quality Bryant Ready Wiring Devices are made in three practical combinations to suit the requirements of each installation:

Switch and Outlet: Switches with "T" rating up to 20 amperes. May be wired with switch controlling outlet or with outlet always alive. Choice of brass or bakelite plates.

Pilot and Outlet: Choice of one-gang or two-gang combinations. Insertion of plug cap lights the pilot lamp.

Switch, Outlet and Pilot: Choice of brush brass or chromium plate. Two-gang size. Pilot light indicates that switch-controlled outlet is in use.

Most Bryant pilot lights are equipped with the new Bryant plastic "jewel."

See Catalog No. 40 for the complete line of Bryant wiring devices. Write for a copy today. The Bryant Electric Company, Bridgeport, Connecticut.

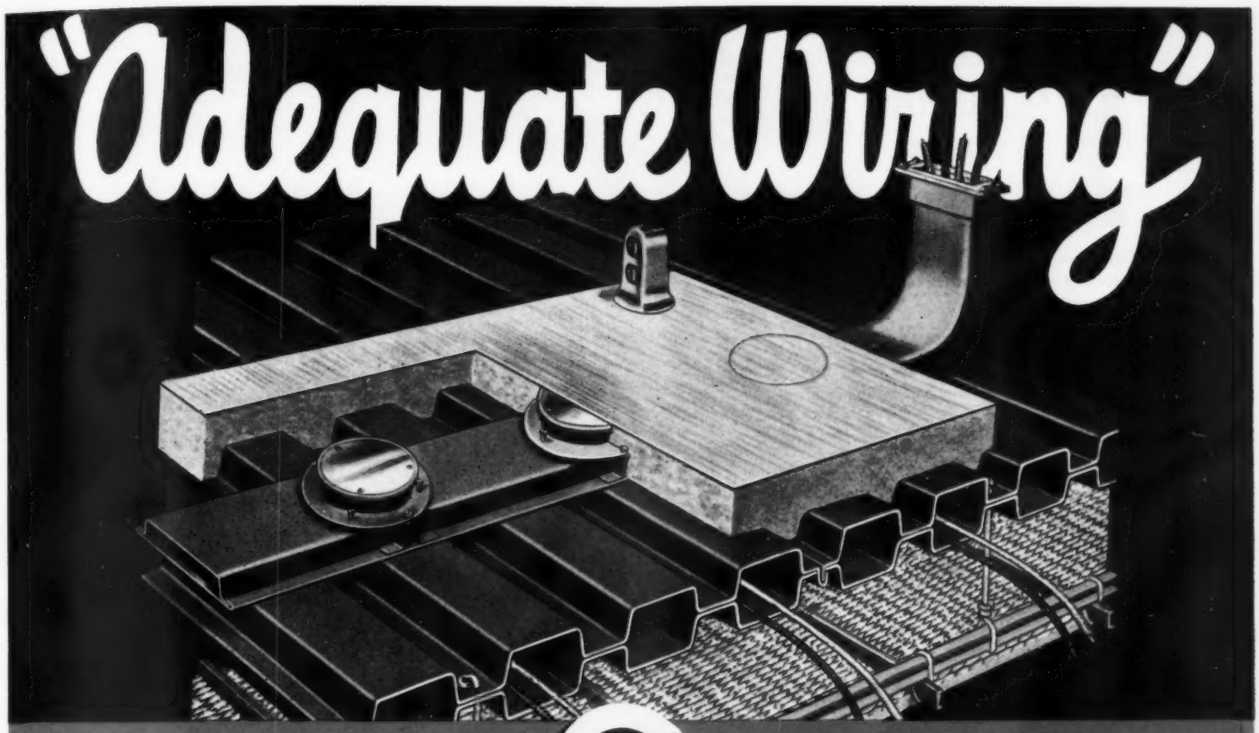
Sold to Electrical Wholesalers Nationally

BRYANT

SUPERIOR WIRING DEVICES

Every outlet deserves a Bryant device

"Adequate Wiring"



...THE Q-FLOOR WAY

ELECTRICAL OUTLETS IN EVERY 6-INCH SQUARE WHERE WANTED

Showing three lines of headers with hand holes, which make possible the placing of floor outlets (for three systems) on multiples of 6 inches over the entire floor area.

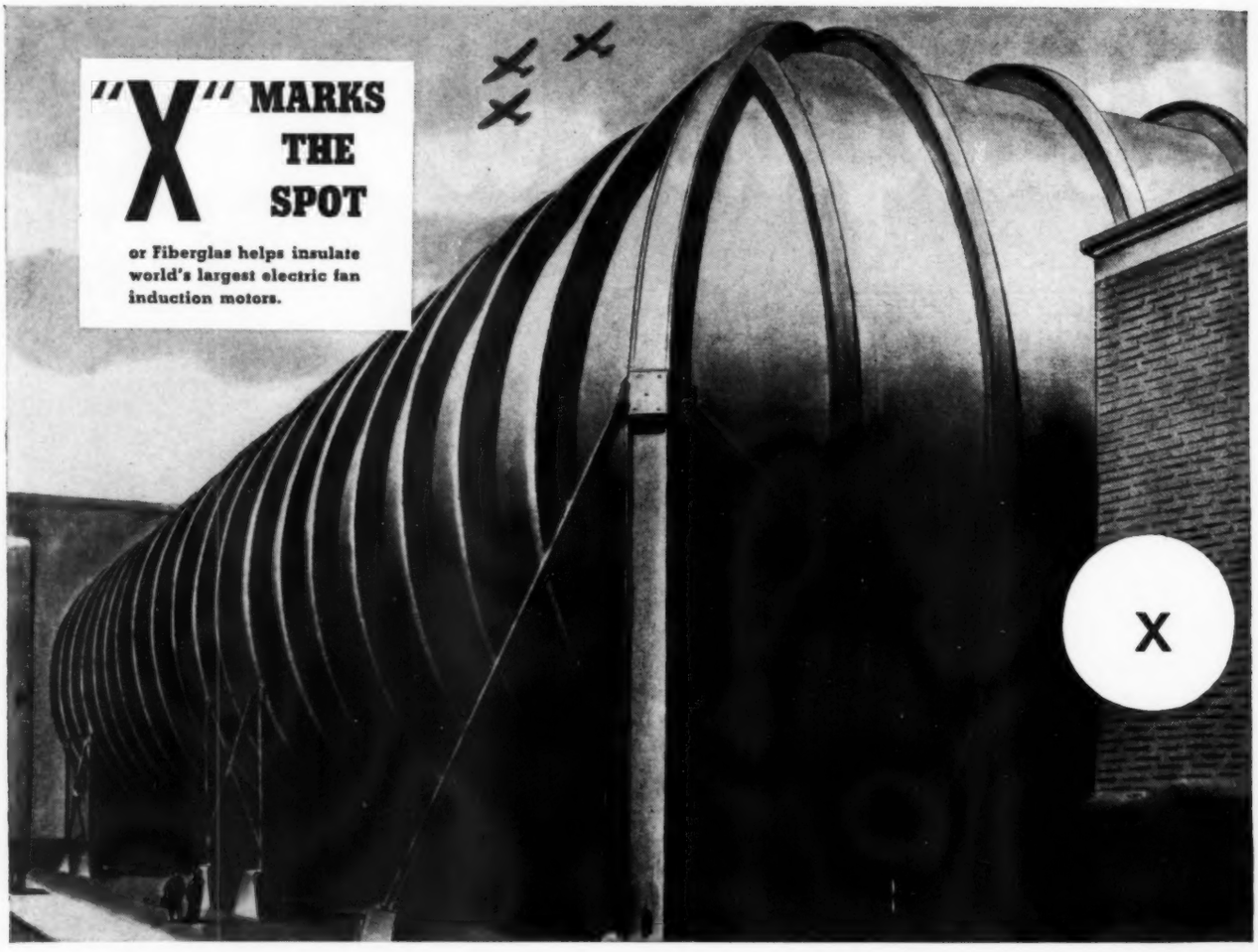
An "Adequate Wiring" installation must provide sufficient "copper" to meet all demands of (1) Power, (2) Safety, (3) Availability—made upon it today and during future years, permitting additional circuits to be pulled in at any time to take care of increased loads. Because the electrical service in so many buildings falls far short of these requirements they are electrically obsolete . . . even though newly built.

Q-Floors completely meet all three of these wiring standards. Of themselves, they form a series of cellular steel wiring raceways which safely carry all the power that will ever be required and make this service everywhere 100% *electrically available.* Study the illustrations. See how each raceway is reached through the Q-Floor system of headers.

Q-Floors mean greater profits for you and greater satisfaction for your customers. They help cut down your overhead because your crews work continuously. There is no reduction in productive labor and materials. Detailed drawings and descriptive data furnished on request.

H. H. ROBERTSON COMPANY
Farmers Bank Building · Pittsburgh, Pa.

ROBERTSON Q-FLOORS



16-BLADE FAN in Army wind tunnel, Wright Field, Ohio, is driven by world's largest induction motor. (40,000 h.p.)This wind tunnel, largest high-speed type ever built, holds an airplane model with a maximum wing spread of 17 feet. Steps up accuracy of new plane designs. Army can take no chances on costly breakdowns of this huge motor. So. in many of the tough spots Fiberglas insulation was used.

What's a wind tunnel got to do with your problems?

YOU have motors. Or generators. Or both.

And you and your equipment are working overtime. Maybe, this overtime work is producing breakdowns. Certainly, it's exposing your equipment to longer and tougher operating conditions. And it's a certainty that new equipment is as hard to get as pulling hen's teeth.

But what's a wind tunnel got to do with these problems? Just this:

The manufacturer of the wind-tunnel induction motors (largest in the world) drew on his vast experience gained in building equipment subjected to unusual and severe service. He picked Fiberglas because it offered maximum dependability. Why not let this experience help guide you in selecting electrical insulation that will give you the same degree of protection?

By rewinding with Fiberglas, you may find that your present overtaxed equipment can be made to withstand excessive loads for abnormal periods of time . . . with no insulation failures. This is because Fiberglas has a long life under high temperatures and a high margin of safety against overloads.

Many manufacturers have found it possible actually to increase horsepower output by slightly redesigning present motor or generator windings and insulating with Fiberglas. If you are faced with the dilemma of a long wait for delivery of new motors or generators, rewinding your present equipment with this glass insulation may solve your production problems.

Of course, if you can get new motors or generators, your manufacturer can supply them with Fiberglas Electrical Insulation on your order.

Why not take a tip from the Army's new wind tunnel? For increased reliability and performance specify Fiberglas electrical insulation. Consult the manufacturer of your equipment or your electrical repair shop now. *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

*T. M. Reg. U.S. Pat. Off.

OWENS-CORNING

FIBERGLAS

A to Z—IT'S EASIER TO SELL HYGRADE FLUORESCENT!

Any way you look at it, HYGRADE Fluorescent lighting equipment is worth looking into!

Everything's right!

It's easier to sell because HYGRADE builds *more quality* into it — quality that results from over *40 years of lighting experience*, a *broader working knowledge* of fluorescent, and *exclusive patents* on fluorescent processes!

It's easier to specify and install because HYGRADE designs, assembles, ships and prices the entire units *complete* — lamps, fixtures, starters, *everything!*

It's surer to satisfy because HYGRADE gives your customer *one complete guarantee* covering every part of every unit.

More money for you

You can land bigger, more important, more *profitable* jobs when you sell HYGRADE . . . because you have the tools to do a *complete*, all-round *better* lighting job. Lamps that keep their brightness longer, from end to end. Fixtures famous for long-endurance, low maintenance and easy accessibility. Starters that really start and re-start. *Everything in fluorescent at its finest!*

Your customers pre-sold

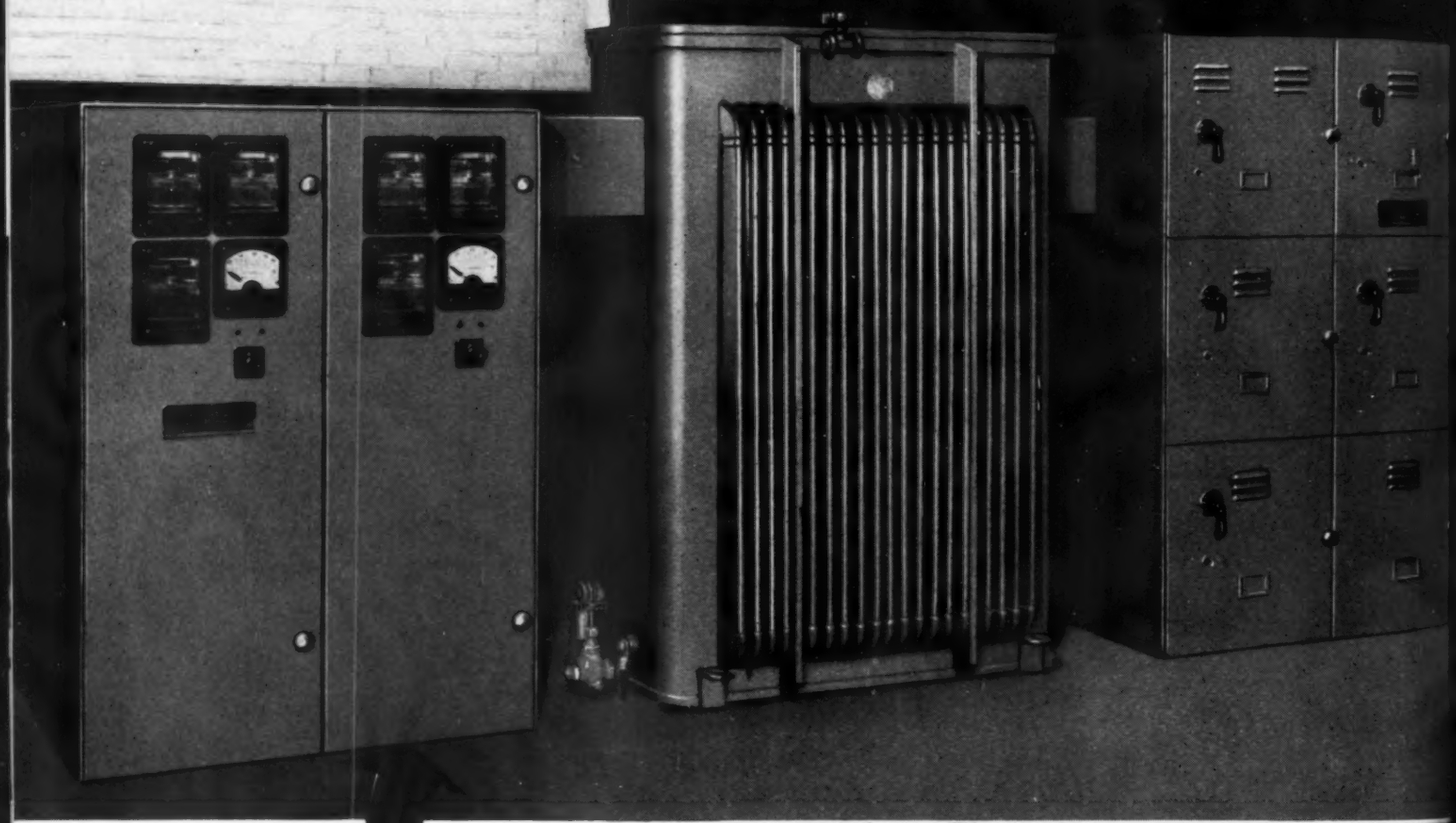
And HYGRADE *is telling these facts to your* customers through aggressive advertising in national magazines and trade publications — advertising read by store owners, office managers, plant supervisors, *and thousands of key executives engaged in planning new defense construction and re-modelling!*

Get going now

It all adds up to a terrific profit opportunity for you—beginning right now! For complete information, catalogue, prices, write — today — to HYGRADE Sylvania Corp., Salem, Mass., Dept. E2. Est. 1901. Also makers of HYGRADE Incandescent Lamps and Sylvania Radio Tubes.

Brilliantly lighted new showroom, Consolidated Edison Company, New York, N. Y.

The New and Better Way



THIS

NOT THIS

Properly co-ordinated for better operation, G-E unit substations are easier to buy, easier to install, more attractive in appearance than old-style, piecemeal substations. And these compact, metal-enclosed units can be located almost anywhere—many times in space that is otherwise worthless.

. . to Provide Low-voltage Power

★ IN INDUSTRIAL PLANTS

★ IN COMMERCIAL BUILDINGS

★ FOR POWER-STATION AUXILIARIES

NEW G-E metal-enclosed, ready-to-install UNIT SUBSTATIONS—completely factory assembled and fully co-ordinated for dependable operation—offer these distinct advantages:

Greater Safety

Metal-enclosing of all live parts means greater safety for personnel. Circuit breakers of proper rating assure adequate protection for equipment.

Quick, Easy Installation—Lower Costs

These units are shipped in two or three *complete* sections —all ready to be bolted together and connected to the power cables.

Build no vaults. Make no long secondary runs. Just set these compact, metal-enclosed units near the load center with an obvious saving in time and expense.

Lower System Investment

System investment and losses are considerably lower because Pyranol* permits installation right at load centers, thereby eliminating long, costly, low-voltage circuits from a distant substation. Performance of motors, lamps, etc. is improved because the voltage-drop in such long, low-voltage circuits is avoided.

Simplified Purchasing

Only *one* purchase transaction, involving a simple, functional specification, is required; the entire equipment comes from one manufacturer. The purchaser is thus relieved of all design and co-ordination problems.

THESE standard *unit substations* are now available for serving loads 600 volts and below (120/208Y, 480 volts, etc.) from incoming lines up to 15 kv. They can be furnished for outdoor as well as indoor installation.

A metal-clad incoming-line section with oil-blast or magne-blast power circuit breakers, a Pyranol* (or oil-filled) transformer section, and a low-voltage feeder section with air circuit breakers comprise these units—smaller editions of the higher-voltage G-E unit substations that have proved themselves in more than 200 central station installations during the last ten years.

Here's the modern way to help assure an adequate, reliable power supply at all times—more important than ever in the light of present conditions. Bulletin GEA-3592 gives further details on these money-saving units. Ask your G-E representative for a copy. General Electric, Schenectady, N. Y.

*PYRANOL is G.E.'s trade-mark for a nonsludging, insulating and cooling liquid that will not burn.

GENERAL ELECTRIC

401-8-170

NO. 8

ALUMINUM, DEFENSE, AND YOU

OCTOBER WAS A MILESTONE MONTH

There have been three other such milestones for civilian uses of aluminum during the past 18 months.

WHEN, ON MARCH 25, 1940, the price of Alcoa Aluminum ingot was reduced from 20c to 19c a pound, it automatically increased the number of civilian applications where using aluminum would be good cost arithmetic.

19¢

Every application carries its own special set of conditions. They determine how much you can pay to save a pound of weight, to get extra heat conductivity, or reflectivity, or what not. 19-cent ingot widened the circle of aluminum's usefulness.

AUGUST 1, 1940 WAS THE SECOND milestone. Economies growing out of greater volume of manufacture, and economies stemming from continuing research, brought the announcement of 18-cent ingot. The civilian manufacturer looking to his future could see, in the offing, more ways to use aluminum than ever before.

18¢

Perhaps you were one of the thousands who filed away in your book of futures the reminder that "when this thing is over, we must figure on using more Alcoa Aluminum."

THIRD MILESTONE showed up almost before you got that note made. November 18, 1940 saw another reduction on Alcoa Aluminum ingot to 17c a pound, making a total reduction of 15% in the midst of a general seller's market. Defense got most of the immediate benefit, but the future of aluminum for you, and you, and you, was writ larger than ever.

17¢

THEN CAME 15c INGOT, effective Oct. 1, 1941, with accordant reductions in fabricated forms of Alcoa Aluminum. This means that the arithmetic of weight saving is all new, since last you figured on using this versatile metal in a civilian application. When the emergency is over, the fact is that all your old material cost comparisons will be as dead as a dodo.

15¢

THE ARITHMETIC IS NEW; but the fundamentals just get more so! More than ever, the strong alloys of Alcoa Aluminum are *the* answer to lightness with strength.

ALUMINUM COMPANY OF AMERICA

Simplify

the operation of protective floodlighting with AUTOMATIC CONTROL . . .

Form KAZ. Once set to go "on" at dusk, "off" at dawn, astronomic dial will continue to automatically change daily in accordance with suntime.

Form VSWZ. Current interruptions will not stop this time-switch, nor affect its "on" and "off" settings. Astronomic dial included.

SANGAMO TIME-SWITCHES

More and more industrial plants are installing floodlighting systems as a safeguard for building approaches, storage yards, railroad sidings, transformer banks, and other vital property. A Sangamo Time-Switch simplifies the operation of this type of floodlighting installation by providing dependable, convenient, and fully automatic control. For instance: With an astronomic dial time-switch, the operation of the lights will change daily to conform with sunset and sunrise. Another example: With a synchronous carry-over time-switch the operation of the switch is unaffected by current interruptions up to 10 hours. Choose the form best suited to your specific requirements from Catalog 1000.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

WHY SIT DOWN ON THE JOB?

END NEEDLESS INTERRUPTIONS!

THERM-A-TRIPS

(fuses with thermal cutout)

give complete, flexible, economical protection to a circuit and its equipment under all conditions. End needless interruption of circuits, but never interrupt safe operation at any time.

Withstand a normal increase in starting current, blow on short circuit, protect against sustained excessive overloads. No moving parts, no mechanism to set. Operate regardless of length of time in service. The plug type indicates positively whether blown by overload or short circuit. For individual motors or circuits with motor-driven apparatus. Plug type, 125 volt; cartridge types, 250 and 600 volts. Ask your dealer or write for our Bulletin 405.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

CONTENTS

NOVEMBER, 1941

17—Earl Whitehorne—*An Obituary*

19—Wiring Merchant Ships—*By D. B. Clayton*
—*How one contractor built a specialty in wiring cargo vessels and how the work differs in materials and methods from ordinary building.*

22—National Problems Before NECA
—*A report of the convention of the National Electrical Contractors Association—What they said—What was done—Short abstracts of papers.*

29—A Big Store Steps Out
—*Gimbel's in Pittsburgh modernized their lighting and used scientifically designed fluorescent units.*

30—Mass Wiring for Mass Housing—*By W. A. Cyr*
—*How a San Francisco contractor wired 772 apartments in small units of prefabricating mass production methods.*

32—Use of Electric Instruments—*By Frank C. Bobier*
—*Pointing out what instruments are useful in modern plant operating and maintenance and how they are used.*

36—Editorials and Back Talk

93—Industrial Electrification—*A Feature Section*
—*Protection Against Sabotage*

Departments

38—Modern Lighting
77—Wiring Methods
82—Motor Shops
86—Questions on the Code
100—Reader's Quiz
107—Estimating
110—In the News
126—Equipment News
138—Advertisers' Index

With which is consolidated The Electragist and Electrical Record

Established 1901

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Manager

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AUGUST ECKEL Eastern Editor
W. T. STUART Middle West Editor
W. A. CYR Pacific Coast Editor
HARRY PHILLIPS Art Editor

A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction —industrial, commercial, and residential.

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17—Earl Whitehorne—*An Obituary*

19—Wiring Merchant Ships—*By D. B. Clayton*
—How one contractor built a specialty in wiring cargo vessels and how the work differs in materials and methods from ordinary building.

22—National Problems Before NECA
—A report of the convention of the National Electrical Contractors Association—What they said—What was done—Short abstracts of papers.

29—A Big Store Steps Out
—Gimbel's in Pittsburgh modernized their lighting and used scientifically designed fluorescent units.

30—Mass Wiring for Mass Housing—*By W. A. Cyr*
—How a San Francisco contractor wired 772 apartments in small units of prefabricating mass production methods.

32—Use of Electric Instruments—*By Frank C. Bobier*
—Pointing out what instruments are useful in modern plant operating and maintenance and how they are used.

36—Editorials and Back Talk

93—Industrial Electrification—*A Feature Section*
—Protection Against Sabotage

Departments

38—Modern Lighting
77—Wiring Methods
82—Motor Shops
86—Questions on the Code
100—Reader's Quiz
107—Estimating
110—In the News
126—Equipment News
138—Advertisers' Index

With which is consolidated The Electragist and Electrical Record

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, and residential.

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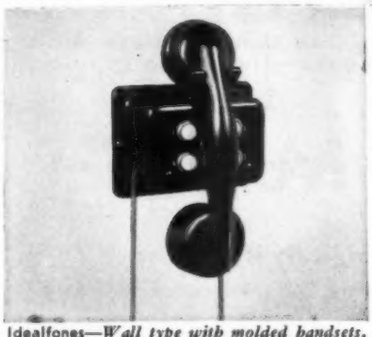

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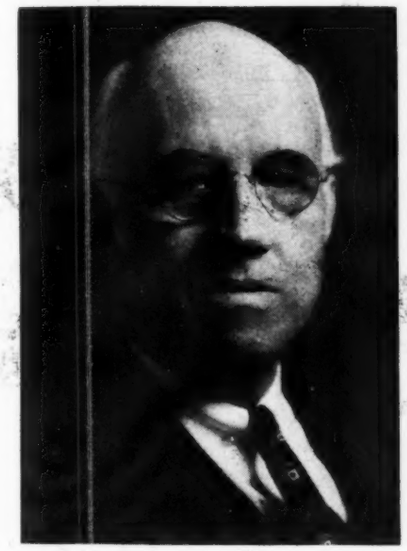


Earl Whitehorne

1881-1941

EARL WHITEHORNE'S work is finished. His voice is silenced. His pen has ceased to write.

He died Thursday evening, October 23, at his home in Caldwell, New Jersey, after more than a year's illness.

He died in the room he had loved. The room that had been his workshop throughout his long illness. The room from which two busy wires carried his tireless voice to his countless friends and associates, from coast to coast. The room in which he dreamed dreams of our industry's great future. The room in which he wrote his masterful editorials that were cheered by thousands.

Earl Whitehorne was a prolific and forceful writer. He was a keen student and a convincing speaker. He loved to persuade, delighted to advocate a cause. When practices were obstructive or unfair, when discussion arose and criticism grew bitter, Earl Whitehorne could be a fearless critic; a critic who made himself heard from the Atlantic to the Pacific.

As a fellow worker, he had those rare qualities of leadership, patience, tolerance and good humor that made him beloved by all. His kindness and encouragement to the younger men, and his unfailing teamwork with his colleagues and management made his loss a heavy one.

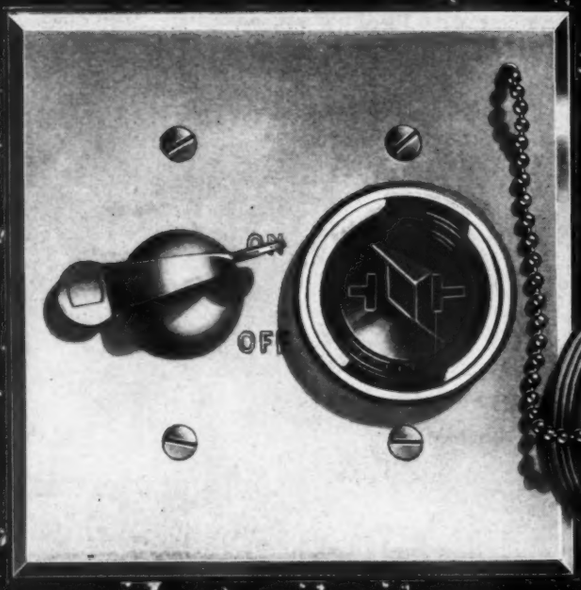
Earl Whitehorne brought honor and stature to business journalism and made significant and lasting contributions to its advancement.

We pause on this page, which has been so significantly his, to pay tribute to the passing of Earl Whitehorne . . . a true friend, a leader and an outstanding editor.

Earl Whitehorne's work is finished. His voice is silenced. His pen has ceased to write — but his words and his memory live on to inspire us.

The Wetter the Better. It only proves the Dependability of

H & H WEATHERPROOF DEVICES

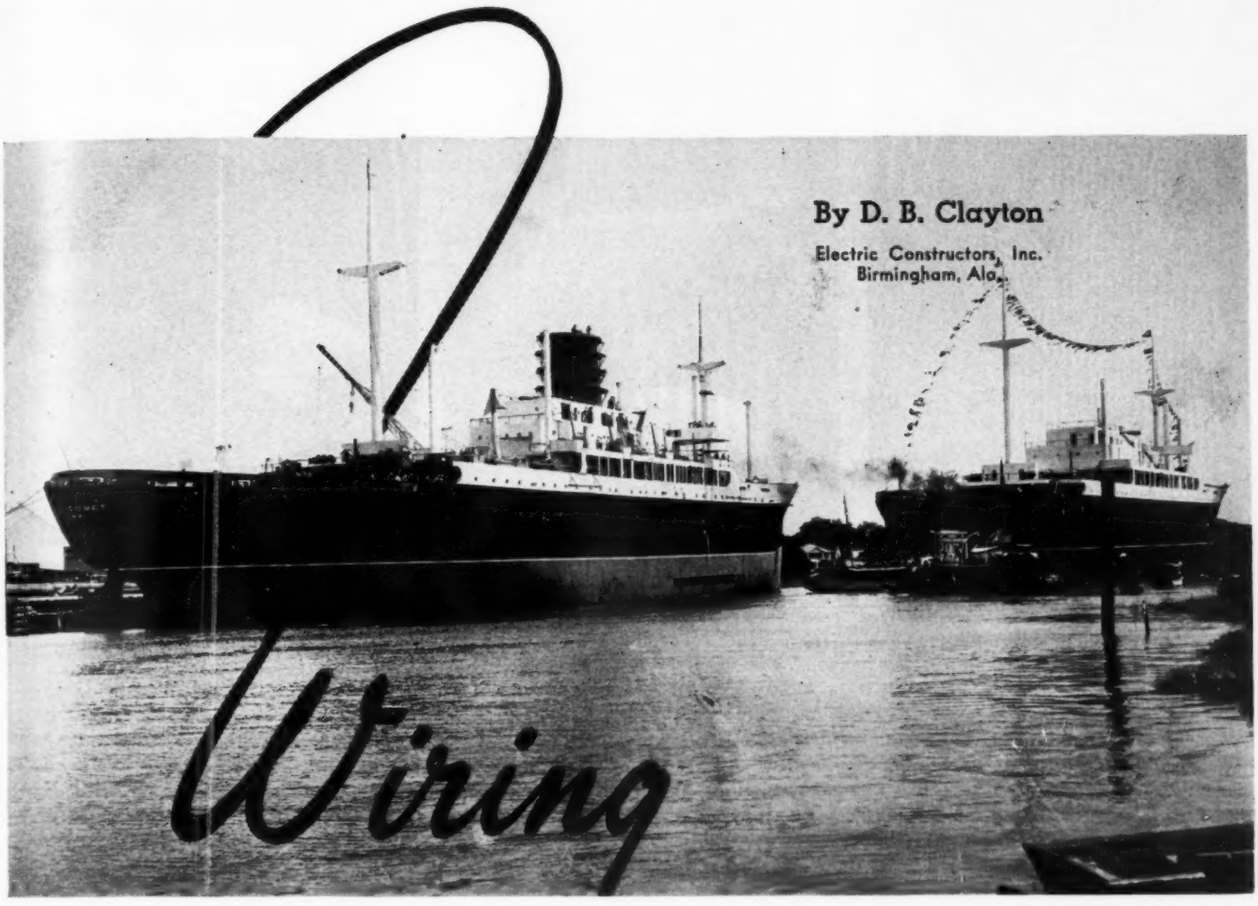


THESE DEVICES defy the weather at outside entrances, in patios, on porches or factory platforms. Immune to exposure, they're everywhere used for *outdoor* operating of lights and appliances.

The Switch (No. 7981) has a rugged, time-tested mechanism. Its cadmium-finished brass plate fits over a rubber mat, weather-tight. Operated by a handy indicating lever. Fits any standard wall box; comes in single-pole, double-pole, 3-way and 4-way types and in 2 or 3 gangs. Also in Switch-and-Receptacle Combination (No. 7886) above-illustrated.

The Receptacle (No. 7792) has cadmium-finished brass plate, fitting on rubber mat, with metal cap to screw over receptacle opening when not in use. When connected, the regular plug cap may be covered with a metal screw cap (No. 7793). Supplied for 2-wire and 3-wire connections, and in Duplex Type (No. 7890). Available with male contacts for use as in auto trailers, where connections may be made in parking areas. Can be had with rounded-edge plates for "FS" type fittings. *For complete listings*, ask for Catalog.

HART & HEGEMAN DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.



By D. B. Clayton
Electric Constructors, Inc.
Birmingham, Ala.

Wiring Merchant Ships

How one contractor built a specialty in wiring cargo vessels on the Gulf, launching a business which grew suddenly into vast proportions of vital national importance.

WE entered the marine field more or less accidentally. A structural steel company for whom we worked started out a dozen or so years ago to build barges and small tankers. Occasionally their vessels needed some wiring and we were called in to engineer and install the systems. It was spasmodic work, and small in volume, but interesting, because it presented problems different from ordinary commercial and industrial installations.

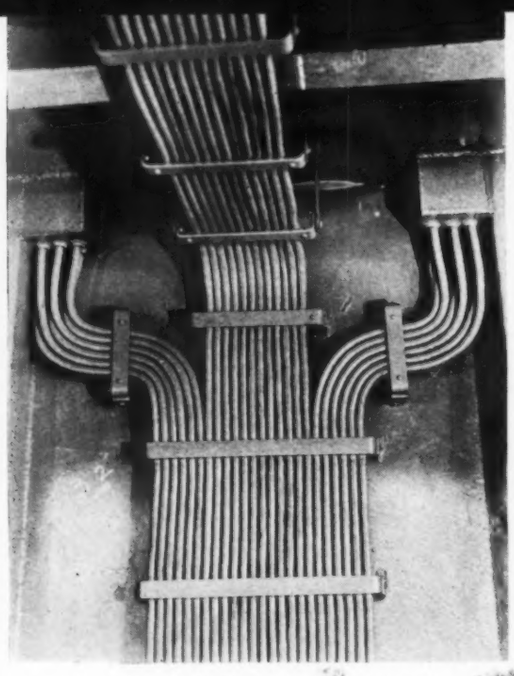
When the Maritime Commission set out to enhance our Merchant Marine, the Ingalls Iron Works Co. took over shipbuilding yards at Pascagoula, Miss. and from our long association with them the electrical work fell to us. They formed the Ingalls Shipbuilding Corp. for this activity and we formed the Electric Constructors, Inc., to handle the work of wiring the yard and to eventually wire the vessels produced there.

Wiring the yard was much like any industrial job. It involved power and light for a large mold loft building, fabricating shop, and forge shop. The unusual feature was a group of feeders with capacity to serve 75 welding machines at each of the four ways and an additional 75 kva. capacity per way for temporary lighting in the hulls.

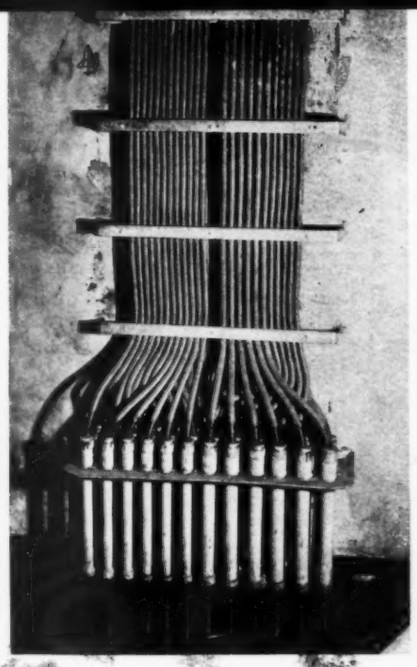
In April 1940 we started wiring the first hull at Pascagoula. Ship wiring is specialized electrical contracting. The type of management can be the same as ordinary commercial or industrial jobs. The skill and technical knowledge, however, are different in scope. Instead of the National Electrical Code we have "Rules For Wiring on Shipboard" as prepared by the A.I.E.E., with further requirements set up by the American Bureau of Shipping and the Bureau of Marine Inspection and Navigation, together with special acts of Congress, and various committee reports.

Materials, likewise, are different from those familiar to most contractors as the wiring must be watertight, as a rule, and in many cases explosion-proof. The largest item of material is cable, which costs ten to fifteen times as much as common building wire. A typical cable consists of a stranded conductor with varnished cambric insulation, braid, jute, tape, lead, and a tinned bronze or aluminum braid over all. It is heavy and requires care to avoid damage in handling and installation.

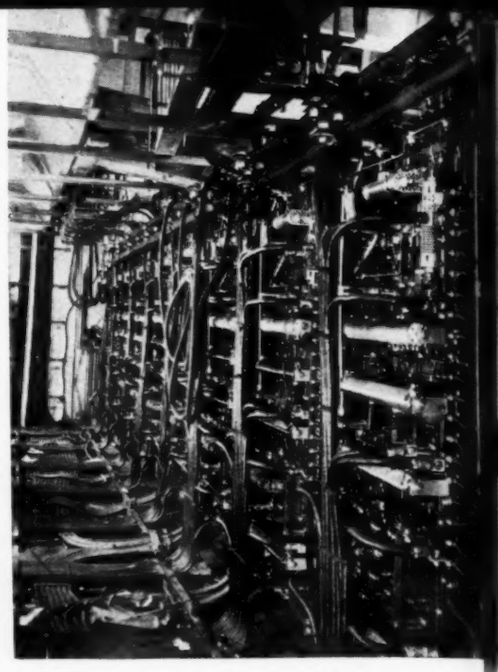
The cable is drawn into hangers



CABLE BRACKETS, *welded to the ship's hold, support horizontal, vertical and offset runs of the marine type distribution cables. Bracket cross bars are removable.*



KICK PIPES *are short conduit lengths threaded into conduit couplings welded to the deck to protect riser cables. Openings in horizontal steel plate hold the kick pipes rigid.*



MASSED CABLES *behind the main distribution board branch out to feed electrical equipment throughout the ship. Solderless lugs are used on all cable connections.*

spaced 14 inches on centers by the cable crew, feeding it through each hanger, pushing and pulling until it reaches its final position. It is passed through openings in bulkheads, through kick pipes in decks and finally through a terminal tube into the equipment. A man must be stationed at each turn during the pull. The cable is finally shaped up and strapped down to the hangers.

Installation Features

Special hand tools are used to split and strip the armor insulation and the ends are prepared for connection by use of cambric tape, linen tape, air drying varnish and serving twine. Connections are made with solderless lugs for all sizes from 1,250,000 cm. down to No. 16.

In non-watertight sections ordinary outlet boxes or condulets are used for switches, receptacles and fixtures with squeeze type connectors holding the cable. Elsewhere cast brass watertight boxes are used with the cables entering through watertight terminal tubes.

Boxes are fastened to the ship by screwing them to threaded "pads" which are welded to the bulkheads or deck; or are bolted to "steps," similarly welded, which extend the box away from the member to which it is fastened. Pads are simple cuts from steel rods drilled and tapped for use of screws, easy to weld to decks and of a size for proper support of cable clamps. Cross bars for the cable hangers are bolted to the vertical members as they are supposed to be "portable" which means removable. Kick pipes (short conduit lengths) are threaded into pipe couplings welded into the deck.

As the ships we work on are all welded, welding is a part of the routine of wiring installation and everything we can weld is so handled. Hangers for main runs, steps for small cables or devices, pads, kick-pipes, bushings, collars, equipment supports and rat proofing are all welded into place. The welding crew is important but are not necessarily first class men as the yard knows welders. Our welding is known as "tacking" rather than production welding and when we need welders we can obtain them from the yard welding school. While our welding can be handled with a 200 amp. machine, the majority of the yard machines are 400 amp. and that is what we use.

Workmen for ship wiring must be experienced or time must be taken to train them in the many little details of ship wiring installation. The size of the installation or the number of men required is affected by what kind of work is handled. There is complete power, lighting and interior communication systems consisting normally of general alarm, call bells, gyro compass and steering, radio, music broadcasting, salinity indicators, shaft revolution indicator, rudder angle indicator, fathometer, electric release for doors, electric whistle control, refrigerated space alarms and temperature indicators, lube oil tank alarms, fuel oil filling alarm, navigation lighting system and emergency lighting.

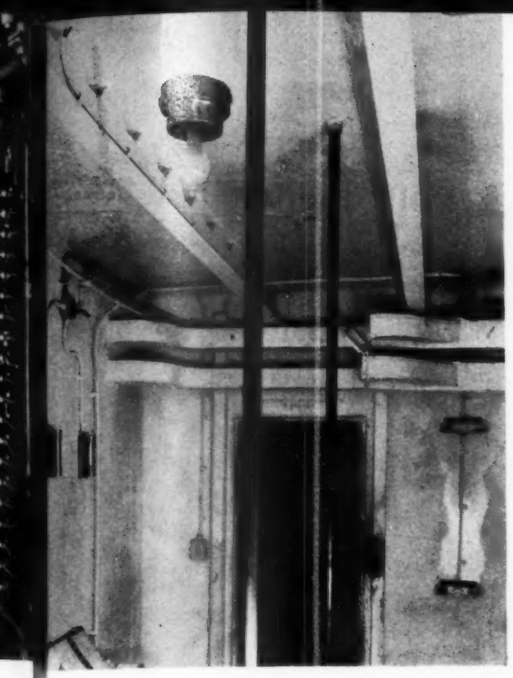
A machinist's crew is needed to erect supports for equipment and apparatus. A welding crew is needed for the various welding items involved such as cutting holes through decks and bulkheads, welding collars, kick-pipes, hangers and various supports of the hull for use of the electrical department. A shop department is needed to make supports for cables and equipment.

Without including the major items of apparatus which are normally furnished by the yard, electrical contracts for merchant vessels vary from $75,000 to $150,000 per ship. The higher prices are for passenger and cargo vessels, where decorative lighting and a large amount of living quarters necessarily call for more elaborate lighting. In the same ratio the number of men required on any one cargo vessel varies from 20 to 75 including machinists and welders, with more men on cargo and passenger vessels.

Heavy Power Loads

Power loads on the modern cargo vessel are heavy. Engine room and auxiliary equipment such as pumps, and compressors vary in size from 5 to 100 hp. There are 16 to 20 cargo winches of approximately 50 hp., an anchor windlass of 70 hp., the capstan aft of 35 to 100 hp., and two steering gear motors of 55 hp. Ventilation and refrigeration add loads of from 100 hp. to 150 hp. and forced draft fans require a total of about 75 hp.

The power plant consists usually of 250 to 350 kilowatt units, two or three per ship. They are controlled by panels at the main switchboard, which is



CABIN LIGHTING *includes a ceiling light, mirror light, berth lights, receptacle, fan outlet and multi-couple radio outlet. Fixtures are non-watertight and cables non-leaded.*

located nearby and includes panels controlling the feeders for lighting and power. Generators are usually 120-240 volts direct current, with grounded neutral.

Distribution centers and panelboards control the power and lighting branch circuits at convenient points. A main switchboard controls feeders with circuit breakers. The auxiliary power panels and lighting panels are knife switch with cartridge fuses up to 200 amp. and fusetrons above that size for power. Toggle switches are used on lighting panels.

Lighting problems are worse than in other types of work due to the many systems grouped in the small spaces available on shipboard. Special methods of mounting fixtures are often required and special fixtures with shades, diffusers or shields may be needed. Also, the continual relocation necessary, on account of other crafts coming after the electrical men, all tend to complicate what otherwise would be a simple system.

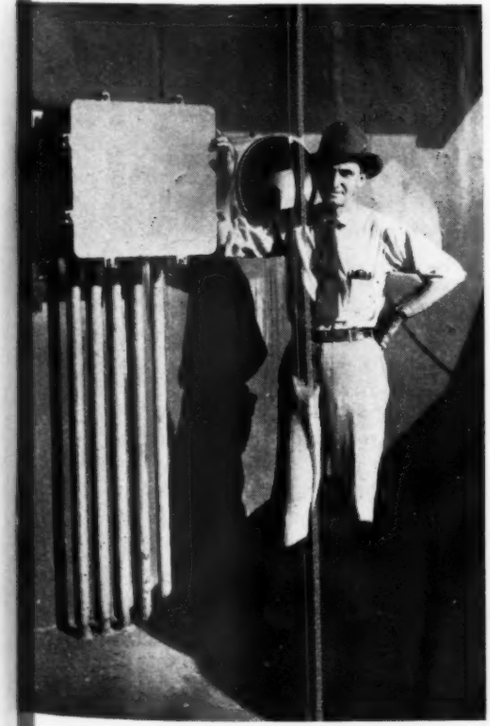
In the hold the problem is to provide lighting in a large space with about 12 ft. of head room so that it will be protected from cargo and will give light needed after cargo has been placed. With full cargo contents, the lights are often covered up and of no value if in fixed positions. Cargo clusters are arranged, therefore, for plugging in at the hatches and carrying into the holds when light is needed.

In the quarters, and other spaces above the hull, special lighting is arranged to meet the conditions. In staterooms there is a ceiling light, mirror light, berth lights, receptacle, fan outlet and multi-couple radio outlet. Fixtures in the quarters are non-watertight and the cables used are not leaded but otherwise similar to other ship cables.

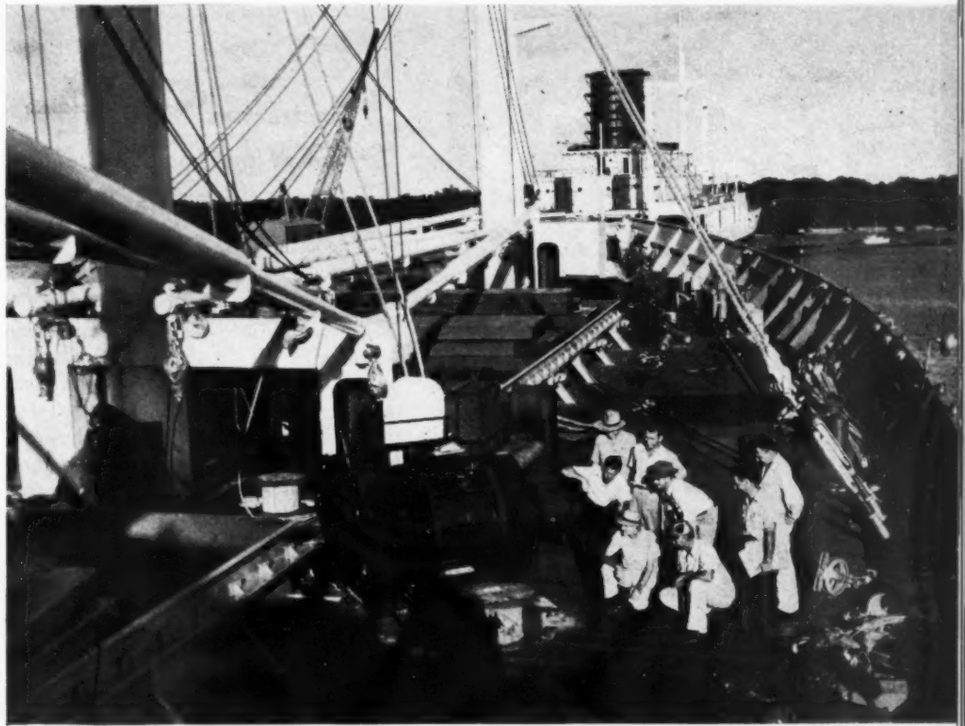
Marine work is the most interesting we have ever handled. The land lubber contractor will find it will not run as smoothly as some industrial work, but an organization can soon be trained to produce fine work, and good work shows up well on a ship. It is a field that should be covered by contract, and one where the yard can be shown where it is to its advantage to contract in some form. A contractor is personally interested in keeping costs down and knows how to do it. The superintendent of a yard's electrical department fails to have the incentive to keep costs down, and very little chance of being checked by one familiar with electrical construction and its costs.

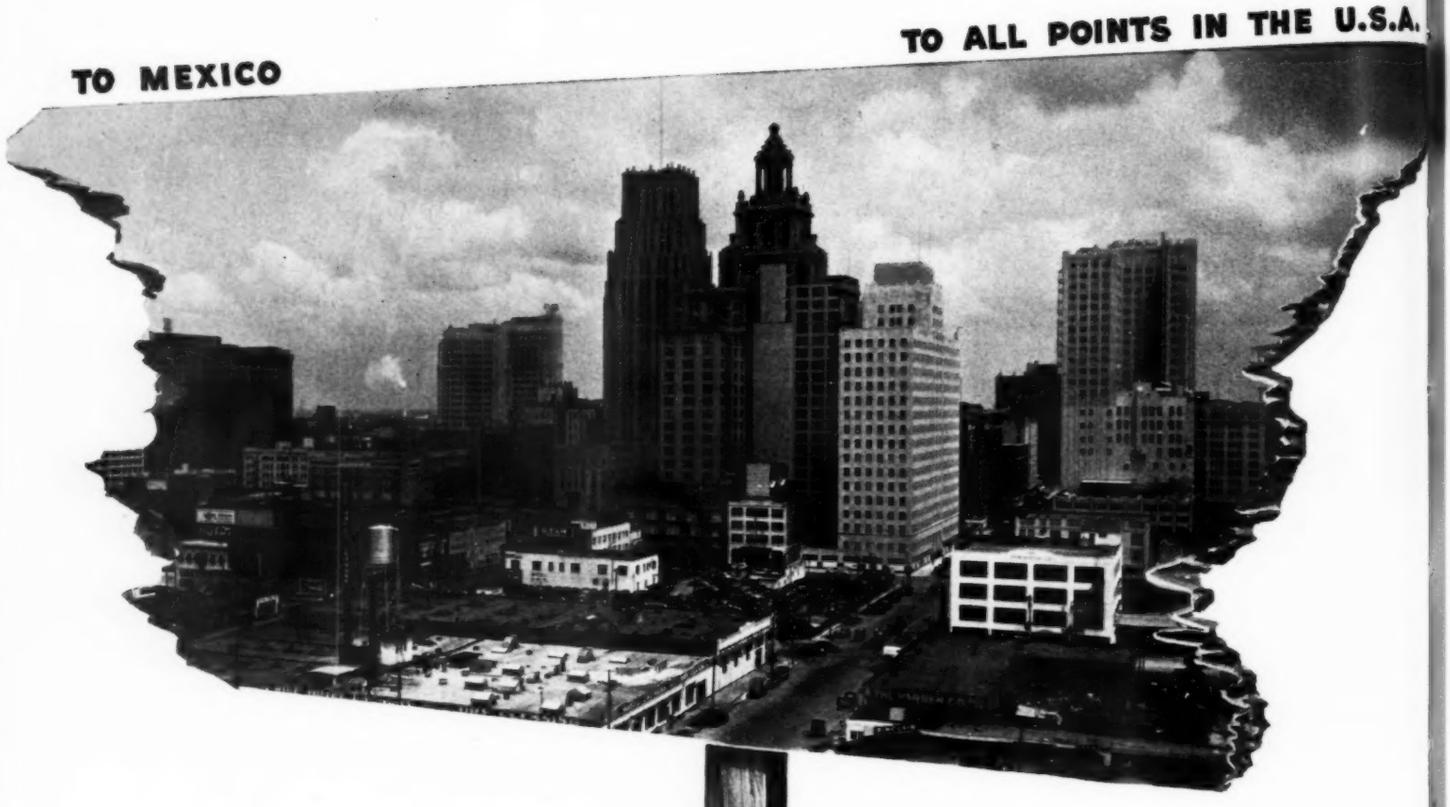
The vast experience of electrical contractors can contribute much to ship wiring. The differences between marine and land work are basically few and well within the capabilities of any first class electrical construction house. There is no place on shipboard for cheap materials or shoddy workmanship. The rules are rigorous and exacting. But there is keen satisfaction in contributing to the safety and prestige of America at sea.

DON CLAYTON, *says ship wiring is not too different from ordinary building and plant wiring.*



CARGO WINCHES, *driven by electric motors, constitute a large part of the ship's power load. An average cargo ship has from 16 to 20 of these in addition to other heavy power requirements.*





NATIONAL PROBLEMS before N.E.C.A.

Contractors tackle priorities and allocations, standardization of materials and a new sales engineering plan. Delegates from 23 states and Canada see critical times ahead.

FACED by booming defense construction, sharply curtailed commercial and non-defense work, new priority status for maintenance and repair and an increasingly critical copper shortage, the 40th Anniversary Convention of the National Electrical Contractors Association met in Houston, Tex., from October 6 to 8. For 400 delegates and guests there were weighty business discussions. And, for some of these, it was the beginning of a scenic vacation in sunny Mexico.

The future course of the electrical industry was viewed with mixed feelings. Many contractors reported that heavy defense work is taxing the capacity of their organizations, others saw a more gloomy picture for contractors in areas where little defense construction is planned or under way. In the presence of a statistical boom many fear the eventual elimination of some electrical contractors from the business scene. Relative to the overall business picture, however, the electrical contractor was seen to occupy a strategic position. All industries must be converted to defense production and the transition must involve extensive electrical alteration and modernization work.

MONDAY

Priorities and Labor

Welcoming the delegates to Houston, dynamic Mayor Neal Pickett extended the customary courtesies in short order, to deliver a brief fighting address that sounded the convention keynote and brought everyone to his feet in a spontaneous ovation as he finished.

President Robert W. McChesney, of Washington, opened the business of the convention by reviewing the moves

NECA executives have made to "save electrical work for the electrical contracting industry." As a result of these efforts, government bodies are now insisting that contracts for electrical work be awarded to electrical contractors. "But the work cannot stop here," he said, "too many of our own group are willing to turn over their services to brokers. Our problem is one of cleaning our own house."

The electrical contracting industry must also save industrial work by selling itself, he continued, and through the work of the sales development committee, NECA is providing ideas and tools.

Reporting on NECA progress during the past year, General Manager Laurence W. Davis announced a membership of exactly 1200. He enumerated several major activities of the organization which have brought forth constructive action, including the work of the labor relations and apprenticeship committees.

"Shooting war or not, we are in a war economy with colossal amounts of raw materials needed for one purpose," John R. Martin, Assistant to the Director of Policy and Chief of Training, Priorities Division, OPM told the assembly. Predicting that shortages will grow more acute, he pointed out that plants to use raw materials are growing faster than new plants to produce raw materials. He warned that the steady increase in consumption of raw materials for defense will continue for "a matter of years," forcing many concerns out of business. Recent rulings of SPAB he indicated were optimistic for the electrical contractor.

The electrical contractor has an important market in utility construction, Geo. R. Conover, Manager of Public Relations, Philadelphia Elec. Co., disclosed in a paper concerning the electric utility and the contractor. "But many utility organizations do not know the contractor is equipped to serve them," he said, urging the contractors to sell their local utility organization on the efficiency and competence of electrical contractors to solve the specialized construction problems of the power company. "The electric contractor is the advance guard of the electrical industry," he continued, "and the utilities' most powerful and helpful ally."

Reporting on the work of the Labor Relations Committee, E. N. Carlson, chairman, of Youngstown, Ohio, enumerated the objectives of the IBEW employers' section. These objectives, he said, are not only cooperation with IBEW in maintaining industry standards and solving labor disputes but include an aggressive selling approach to industrial concerns and utilities to show them the advantages of using electrical contractors for all electrical construction work.

Carl R. Schedler, of the Department of Labor Conciliation Service, speaking for Daniel W. Tracy, Assistant Secretary of Labor, congratulated the electrical contractors on the "honorable and progressive" work of the Council of Industrial Relations which has minimized the need for the conciliation service in the electrical construction industry. "Most employers, today, understand the problems of labor," he said, "and those who use the conference table will almost invariably adjust their differences." The work of the conciliation service, he continued, is to supply skilled third persons when employers and labor cannot find a reasonable solution to get at basic issues and differences, to find solid grounds for settlement. The conciliation service cannot force a settlement, he said, but when unable to reach a solution may certify the issue to the National Defense Mediation Board.

W. L. Ingram, vice-president of IBEW, Ft. Worth, Tex., urged "organization, education and understanding" for a united industry. "There is no place today for the rugged individualist," he said, "he still has constitutional rights but he can't eat them." The contractor has one of the hardest problems in the industry, he admitted, with well organized groups pushing into his field, but the contractors may be assured, he continued, that IBEW wants to help in this battle. He expressed the hope that at the next convention the contractors will work with labor leaders to make plans for the elec-

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1 HONORED—*R. W. McChesney receives the James H. McGraw Award Contractors Medal for 1941 from L. K. Comstock, while Mrs. McChesney looks on.*

2 TEXAN CHARM — *Mr. and Mrs. Paul Wright, from picturesque San Antonio, enjoy the festivities.*

3 PARLOR CONFERENCE—*Chicagoans A. C. MacWilliams and S. W. Donaldson enjoy a confab enroute to Houston.*

4 SCOTT DUO—*Similarly attired, but unrelated, O. V. Scott, Miami and H. L. Scott, Corpus Christi drink a toast.*

5 BUSY HOSTS—*J. R. Fisk and Alan Cooke of Houston did a grand job of keeping their guests busy and happy.*

6 NEW YORKERS—*A. Lincoln Bush, New York City and George F. Butler, Buffalo confer on statistics.*

Electrical Work for Electrical Contractors

R. W. McCHESNEY,
President, National Electrical Contractors Association

ELECTRICAL contracting is a highly technical engineering profession, requiring years of study and experience to efficiently and safely serve the public. Qualified electrical contractors have built organizations of skilled electrical workers, backed by competent engineering, purchasing and supervision. These constitute the electrical contracting industry.

A serious threat to this industry was the temptation of general contractors, under the negotiated cost-plus-fixed-fee contracts, to set up hastily assembled, inexperienced, uncoordinated electrical departments to do construction work. NECA has successfully fought this and now Government departments recognize the principle of "specialty work by specialty contractors."

Another threat is the increasing amount of construction work being done by plant crews. The qualified electrical contractor can do this work at less cost and less burden to the plants. He has the organization, specialized equipment and is in close touch with the latest developments in electrical equipment and construction methods. These are sales facts which the contractor must use to save this work for himself.

National Defense & Priorities

JOHN H. MARTIN, *Priorities Division, O.P.M.*

COLOSSAL amounts of raw material are needed. There are two miles of copper wire in a bomber, two million pounds in a battleship. One three inch anti-aircraft gun will consume $134,000 worth of ammunition in an hour.

The copper shortage is further aggravated because we are building more plants to consume scarce materials than plants to produce them. We must plan in terms of mounting consumption over a matter of years.

On the optimistic side, SPAB has indicated a favorable attitude toward releasing scarce materials for 1. The maintenance and repair of all industry, 2. Industries requiring small amounts of scarce materials for large amounts of product, 3. Industries in the process of changing to defense work to hold the organization intact during the transition period.

The emphasis is gradually shifting from priorities to allocations or the control of the distribution of scarce materials from the source. This is not a change of policy but one of mechanics. The Priorities Division will give preference rating to 300,000 houses on applications made through F.H.A.

trical industry when the defense boom is over.

"Not to keep the peace, but to use cooperation with union labor for the growth and health of the industry"—is the big job in labor relations, Paul M. Geary, Representative of the IBEW Employer's Section, reported in a review of the problems of promoting public acceptance for the work of the electrical contractor. "Cooperation is essential economically in the electrical construction industry," he asserted, "but there is a vast difference between cooperation and collusion."

The strike is outmoded, L. K. Comstock, Chairman, Council on Industrial Relations, New York, stated in a discussion of several typical criticisms of the actions of the Council. "That the strike is still used to gain legitimate and illegitimate aspirations on the part of labor is almost wholly due to the persistence of tradition founded years ago on factors in labor relations which have largely disappeared," he said. Cooperation and collaboration are the lubricants of industry, he remarked in concluding, and the Council has adopted the theory that the fundamental interests of em-

1. MODERN *equipment exhibit is studied by H. J. Miller, Jacksonville and A. H. Wilson, Washington.*

2. ORCHID ROW *includes Chicago ladies, Mrs. W. W. Giessen, Mrs. A. C. MacWilliams, Mrs. J. W. Collins, Mrs. W. Marks and Mrs. F. S. Barry.*

3. C. S. LONG, Kansas *City, Mo., and W. T. Foley, Kansas City, Kan., snapped in front of a lighting booth.*

4. CONTRACTORS *P. M. Wray, Cincinnati and Louis Robinson, Philadelphia discuss new bus bar system exhibited by T. A. Vernon, Houston and C. O. Davis, Memphis.*

ployer and employee are identical.

In closing the labor relations session, E. H. Herzberg, Chairman, Apprentice Training Committee, Milwaukee, Wis., announced the successful development of a nationwide apprenticeship training standard. Through close cooperation with IBEW and government officials the NECA apprenticeship committee developed a plan under which apprentices will serve under a joint local committee and may be transferred to different shops when necessary to provide complete training.

EAST OR WEST *contractor problems are the same J. J. Newitt, Los Angeles, and M. W. Scarborough, Roanoke, discover over cocktails.*

PRIORITY PROBLEMS, *discussed by Hy Trester, Milwaukee, O. W. Holmes, Fayetteville, W. Hoffman, Knoxville.*

TUESDAY

Sales, Statistics and Research

An engineering approach to the electrical contractors sales problem highlighted the sales development conference on Tuesday morning, introduced by D. B. Clayton, Chairman of the Sales Development Committee. Clayton warned of the uncertainties of the immediate future as a result of priority restrictions. He expressed the hope that contractors would hold their regular industrial functions by searching out work carrying priority status.

"Save electrical work for the electrical construction industry by building up a sound sales development program," George Diehl Mateer, Consulting Engineer, Philadelphia, Pa., urged in presenting a three point engineering sales plan based upon systematic power and light surveys coupled with methodical sales presentations. "There are now 30,000 salesmen selling our market," Mateer warned in speaking of the inroads of direct wholesaler and manufacturer competition with electrical contractors, "indicating the importance of market research for selling today." The electrical contractor needs a planned, organized selling attack, he continued, including:

1. Systematic electrical surveys to provide a comparison of existing plant wiring with recognized modern standards.
2. Technical references and guides, prepared by NECA, to provide data for the contractor's engineers that will make the customer buy.
3. Selling tools in the form of sales demonstrations and sales presentations to provide a complete sales story for each project.

"Cooperation and sound procedure are important because engineering responsibility must be demonstrated by the electrical contractor," Mateer stated, "and transposed into the language of the buyer." During the discussion following it was brought out that some moral backing might be expected from insurance companies in this sales project.

Electrical contracting is close to a half billion dollar industry, A. Lincoln Bush, Chairman of the NECA Statistical Committee reported on business volume. The 1940 census, he stated, shows approximately 223 million dollars worth of electrical construction done by 15,915 established electrical contractors

Wire and Cable Simplification

GEORGE ANDRAE, *Herman Andrae Electric Co., Milwaukee*

THE wire and cable simplification proposal was given voluntary written acceptance by nine Federal departments, in Washington, 57 municipalities from coast to coast, over 700 manufacturers, distributors, electrical contractors and others classed as users, and by 24 trade associations. The Federal government has included the simplified practice recommendations in the Federal Standard Stock catalogue.

We have succeeded in arousing more interest in the study of wires and cables throughout the country than has existed for years. For the first time the National Electrical Code Committee has a separate article committee on conductors—Article 310. If we go along regular lines of Code procedure we may have simplification of wire types about November 1943—two years hence.

Because of the present situation on rubber, copper and steel, steps must be taken now to relieve the material shortage and clarify the wire and cable muddle. If OPM officials could be interested and would issue orders for the proposed wire simplification on the basis of material conservation it might be accomplished quickly. NECA should take immediate steps to ascertain the most expedient solution to the wire and cable simplification problem.

Utility Work for the Contractor

G. R. CONOVER, *Philadelphia Electric Company, Philadelphia*

I SAY to you without reservation—the advance guard of the entire electrical industry, and one of the utilities' most valuable allies, is the electrical contractor. Our company has a progressive policy of awarding more and more of our construction work to electrical contractors.

Right now, a Philadelphia electrical contractor is completing the first substation job. Another is to be handled the same way. Contractors are doing some of our line construction and we are considering calling in a contractor to do another type of construction which our men have always done before. We have no altruistic motive. It is an economic and practical gesture. In the long run we save money.

There is one factor which I do not believe you have fully recognized. Many utilities have for years built up specialty forces and their engineers are not convinced that contractors have the equipment or knowledge to do this work. We have learned that they have. Convincing the utilities of your ability to do their construction work is a selling job that will put more profit dollars in your pocket.

We know the contractors in our city—and they know us. We make it our business to cultivate their friendship and will continue to do so.

Protecting the Electrical Construction Industry

P. M. GEARY, *IBEW-Employers' Section, NECA*

THE electrical construction industry is vulnerable because it is considered a small branch of two major industries, electrical and building construction. It is by no means exempt from absorption by a more powerful industry. The business interest having first contact may feel that something is being thrown away if it cannot satisfy all customer requirements. Destructive competition among ourselves is another curse.

But we have one blessing—good labor relations. Our problem is not keeping peace, but learning to cooperate to promote our industry. Lack of stability reigns because the average electrical contractor does not know what, or how to get what he wants from his trade association.

A contractor cannot secure a profit unless he is willing to let his competitors do so. Protection of the electrical construction industry requires more and better organization, local, state and national—now, more than ever before. If our industry had proper organization in the past, it would have been able to grow in proportion to the construction industry as a whole.

What the Customer Should Know

J. W. COLLINS, *Secretary, Electrical Contractors Association, Chicago*

IT seems this industry has confined most of its activity to handling the business after customer negotiations have been completed. Little has been done to establish proper conditions before the customer signs. This might result since most contractors are graduate mechanics whose sole interest has been to find out how much it costs to make an electrical installation.

Stereotyped plans, specifications and minimum standards produce a system that generates and multiplies price competition and retards our industry. We need "Going Jobs" which have no stereotyped specifications but have individual analyses.

And we need "Going Contractors" who will go beyond minimum Code standards, include additional features in the electrical installation and set them down as true values that the customer can understand and appreciate. Such a process would produce "Going Costs". It would reduce competition to fair proportions and promote additional employment of electricity to the customers benefit.

in the country. However, power lines, R.E.A. construction, installation of generators and transformers and work for public utilities handled by electrical contractors brings the total to over 400 million, he indicated.

Statistics are essential to the industry, he stated, and urged contractors to cooperate with the national office in providing data required.

The customer, too, should know something about electrical construction, J. Walter Collins of Chicago insisted. In several humorous but pointed phrases he dissected the electrical contracting industry to expose weaknesses in sales approach.

"Cost data has proved consistent but our greatest difficulty is to find contractors who will believe costs were not selling prices, or who had faith enough in any system to properly price jobs," he said. "It will only be done by generally accepted standards of values supported by faithful and definite performance." He presented charts illustrating business costs prepared by the Chicago Electrical Contractors Association.

WEDNESDAY

Standards, Estimating and Business

Assisted by specialists from prominent wire manufacturers, George Andrae, Chairman of the Codes and Standards Committee, reported on the progress of NECA toward simplification of wire sizes and application data. As a result of studies in cooperatic with OPM, the Bureau of Standards, FHA and other interested groups, more effort has been made to simplify the Code tables, he said. "The industry conference, resulting in the elimination of sizes, 5, 3, and all over 500,000 c.m., and Interim Proposal Number 38 has succeeded in creating and arousing more interest in wires and cables than has existed for years," he continued. "Further action is imperative and delay means waste."

1. OPTIMISTIC — *Regardless of priorities, George Gamp and Russel Vierheller, St. Louis, found plenty of optimistic factors in convention discussions.*

2. CONGRATULATIONS — *Secretary-Manager Larry Davis modestly parries compliments from A. L. Stone, Los Angeles, on the convention arrangements.*

3. PROTECTION — *W. B. Kline, Corpus Christi, (left) asks about circuit protection. Harry Duke, New Orleans and Joe Ingram, St. Louis have the answers.*

4. PERSONALITIES — *Mr. and Mrs. Leo Gamp, St. Louis (left), Ed Vanderlinde, Rochester, N. Y., and W. W. Hanks of Charlotte, N. C., enjoy cocktails.*

5. HARMONY — *Ernie Carlson (left) tells Wm. McCarter, Philadelphia and A. B. Conklin, Sr., Youngstown about the importance of sound labor relations.*

The present recommendations propose a standard of type R wire for sizes 14 to 1 and type RH for sizes from 1/0 to 500,000 c.m., suggesting that sizes 10, 6, 2/0, 4/0, 250,000 c.m., 300,000 c.m. and 400,000 c.m. be dropped from general use. The remaining wire sizes correspond to standard switch ratings.

"Ways and means must be found to clarify the wire and cable muddle now," he warned. "For the sake of maintaining our Code procedure, we cannot sit by for two more years and jeopardize the standards themselves."

Following the discussion, the convention voted to approve Andrae's report, an action interpreted as a vote of confidence to the work of his committee.

Speaking for the Cost Data Committee, George Patterson, Chairman, of Toronto, urged the contractors to send in experience data to aid the committee in preparing the manual data sheets. "No data is released," he said, "until checked from several sources, consequently there is always a need for more data on proven costs." "A peace time baby, the Manual has proved to be a giant of war," he continued, "providing accurate material for estimating the great number of projects required for national defense."

Extending Toronto's hearty welcome for the 1942 convention, Patterson assured cordial and simple border formalities for delegates and exhibitors.

The general convention program was concluded with a paper prepared by Col. O. R. McGuire, NECA General Council, Washington, presented in his absence by Laurence W. Davis. Reviewing the history of the relationship between business and government, Col. McGuire urged the contractors to keep in close touch with governmental developments which are affecting their whole business structure today.

Officers Reelected

At the annual business session L. K. Comstock, Chairman of the Council on Industrial Relations, received an Honorary Life Membership in the National Electrical Contractors Association. The National Apprenticeship Standards, presented by E. H. Herzberg, were officially endorsed and several proposed changes in the Constitution and By-Laws approved.

The complete slate of officers whose terms expired at the 1941 meeting were reelected to their present posts. They include:

Robert W. McChesney, President, Washington, D. C.; Executive Committeemen, A. Lincoln Bush, New York, N. Y.; D. B. Clayton, Birmingham, Ala.; Eugene Ashe, Houston, Tex., and G. W. Patterson, Toronto, Canada. Districts 11 and 12, eastern and western Canada, were consolidated in District 11.

McChesney Gets McGraw Award

At the annual banquet, Robert W. McChesney, executive vice-president of Harry Alexander, Inc., and president of NECA, received the James H. McGraw Award Contractors Medal for 1941 for outstanding service to the industry. L. K. Comstock of New York made the presentation for the Committee of Awards. The citation reads:

"Robert W. McChesney, executive vice-president of Harry Alexander, Inc., heading their branch in Washington, D. C., as president of the National Electrical Contractors Association and a close observer of the Nation's Capital, sensed early in the government's program for National Defense, a serious threat to the rights and future of the specialized sub-contractors engaged in building construction. Following the government's decision to have its work on cantonments, navy yards, flying fields, arsenals, shipyards, and war factory construction handled by large general contractors on a cost-plus-fixed-fee basis, it became soon apparent that the general contractors would organize new departments in their staffs to handle electrical work, by hiring men away from experienced skilled electrical contractors and building up their own electrical departments at government expense both in time and cost. The same policy applied in the fields of plumbing, heating and air conditioning.

"Mr. McChesney took it upon himself to get to the bottom of this situation. He called in the national associations of the other specialized sub-contracting trades and built up his case. He laid the facts and all their implications before the government and demonstrated to the Army, the Navy and the Maritime Commission that it was not in the public interest that these skilled sub-contracting organizations be destroyed or that their work be done at higher cost to the nation to suit some apparent expediency in the placing of contracts. These principles were recognized and accepted and the government policy was revised and announced by the President.

"But there continued to be many conflicts with this policy in the field. Mr. McChesney therefore sustained his efforts to combat this practice, wherever found, first, to resist the inroads of the general contractor in large National Defense construction and second, to prevent the upbuilding of a war inflated staff of electrical workers that would remain in the field when the emergency is over and demoralize our industry. In this he has been highly successful. Without his able leadership and tactful negotiation, his wide knowledge of the economics of construction and his untiring watchfulness and energy, the very existence of the electrical contractor would be threatened today, by these inexperienced and excess organizations, established and trained at government expense.

"In recognition of this outstanding personal contribution to the advancement of the contracting branch of the electrical industry, the judges have awarded to Mr. McChesney the Contractors Medal and Purse for 1941, given under the James H. McGraw Award."

Mr. McChesney was selected for this award by a committee of electrical con-

MIDWESTERNERS *included in Chicago's delegation were Wm. McQuineas, W. W. Giessen, Frank Vogel, Wm. Weiss, Ben Olsen, Bill Marks and A. C. MacWilliams.*

KANSAS CITY *turned out one of the largest chapter delegations. (L to R) F. E. Geiss, A. M. Burnett, W. T. Foley, A. E. Smiley, M. A. Haverhill, W. C. Bryant, E. L. Fickey.*

BAGGAGE SMASHING *progresses under the critical eyes of Ben Olsen, F. W. Lord, Bill Weiss, C. C. Cadwallader and A. C. MacWilliams.*

tractors appointed by the National Electrical Contractors Association, including: A. Lincoln Bush, New York; George E. Davis, Newark; E. G. May, Albany; George H. McKee, Mt. Vernon and Earl Whitehorne, New York.

Electrical Products Show

Many prominent manufacturers of electrical wiring materials and equipment displayed their products in exhibits adjoining the meeting hall. Special interest centered around fluorescent lighting equipment, enclosed bus bar systems and small diameter wire displays. Important new developments in panelboards, circuit breakers, explosion proof fittings, motor starters, tamper resisting fuses, fluorescent auxiliaries, porcelain wiring, and electronic control apparatus were shown together with wiring devices, cables, conduit and fittings.

Those exhibiting were: Frank Adam Electric Company, Appleton Electric Company, Benjamin Electric Manufacturing Company, Allen-Bradley Company, Bull Dog Electric Products Company, Bussmann Manufacturing Company, Crouse-Hinds Company, General Cable Corporation, General Electric Supply Company, Hygrade Sylvania Corporation, Jefferson Electric Company, O. T. Jenkins Company, National Electrical Products Corporation, Porcelain Insulated Wiring Systems, Reichardt Electric Company, Square D Manufacturing Company, Triangle Conduit & Cable Company, United States Rubber Company, Westinghouse Electric & Manufacturing Company, Wilson Electric Equipment Company.

FOUR STATES *are represented at one table. F. W. Lord, New York City; J. J. Newitt, Los Angeles; M. W. Scarborough, Roanoke; and C. O. Reckard, Detroit.*

Texas Welcome

Houston hosts arranged a brilliant, unforgettable series of social events, with characteristic Texan hospitality. A Sunday night reception and buffet supper was held on the Rice Hotel roof with gay nautical decorations. The ladies enjoyed a bus trip to Galveston and the Gulf on Monday with luncheon at the Buccaneer Hotel, returning for an open house reception and bridge party in the evening. Several reels of Kodachrome movies taken during the 1940 post-convention tour to Cuba were shown.

A sightseeing tour of Houston and the San Jacinto Battle Grounds with a luncheon and entertainment at San Jacinto Inn for the ladies on Tuesday terminated at the Brae Burn Country Club. Here they joined the men.

The social program wound up in a brilliant banquet and dance Wednesday night. More than 100 departed the following morning for a post-convention tour to Mexico City.

The social program was arranged by committees from the Houston Chapter headed by General Convention Chairman J. S. Copeland, assisted by J. R. Fisk, chairman of the entertainment committee, Mrs. J. S. Copeland, general hostess and their committees.

CANDID SHOTS—*(1) W. J. Varley tells Wm. McGuineas the San Francisco rewiring story. (2) Cocktails are enjoyed by Mr. and Mrs. E. Herzberg, Mr. and Mrs. W. J. Rohn and Mr. and Mrs. "Dock" Keith. (3) Paul Geary discusses labor relations with Ed Vanderline. (4) Bill Marks chats with Ed. Herzberg.*

GENERAL LIGHTING *in the order of 30 foot-candles speeds up selection and sales of merchandise in this clothing department. Show case displays are highlighted to 150 foot-candles. All units are fluorescent.*

FIXTURE MAINTENANCE *is simplified by the snap-lock hinged glass enclosures. Dark end areas at fixtures are eliminated by 15-watt cross lamps, each with a reflector.*

A BIG STORE STEPS OUT

The Pittsburgh branch of Gimbel Brothers department store is modernizing its sales floors with scientifically designed fluorescent lighting. And the technique employed is applicable to small as well as large stores.

THAT light dramatizes merchandise and steps up sales has long been recognized by the management of Gimbel Brothers department store of Pittsburgh, Pa. And so the management watched with intense interest the development of the new fluorescent light source, with an eye to using it as a merchandising tool.

They surveyed the existing store lighting system and found it woefully lacking in the necessary sales punch—only 5 to 7 foot-candles of general lighting and 18 to 20 in the showcases. They carefully studied fluorescent lighting, experimented with it, used various colored lamps and ceiling paints, and had a special fixture scientifically designed. Finally they hit upon a combination that gave the light quality and distribution they desired.

General lighting in the sales areas is provided by shallow, totally enclosed, surface mounted, ceiling fluorescent units, spaced on 10-ft. by 14 ft. centers, 12 ft., 4-in. above the floor. Two outstanding features of these units, made by the Pittsburgh Plated Products Co., are the elimination of dark areas at the fixture ends and the ease of maintenance. Dark end areas are eliminated by the use of two 15-watt, T-12 lamps at right angles to each end of the four 40-watt, 3500° white lamps. Each lamp has its individual Alzak aluminum reflector behind which are mounted the fixture auxiliaries and wiring.

Fixture maintenance is simplified by the lap-hinged, glass enclosure which consists of a welded aluminum frame containing Holophane controlen panels in the bottom and round molded diffusing glass panels at the sides and ends. The enclosure is held in closed position by three snap-out keys which fit into the fixture bed plate.

Many of the units installed are equipped with convenience outlets in the bed plate to facilitate the connection of auxiliary spotlights for highlighting.

In general, the new fluorescent units were mounted over existing outlets, replacing the original 300-watt incandescent units. Where these outlets interfered with the new spacing, they were capped and bx cable was chased in the ceiling to the new fixture positions. A peach color tint was incorporated in the ceiling paint to cast a soft color light on the customers.

All lighting in showcases and wall case displays was changed to fluorescent. Areas under air conditioning ducts were equipped with indirect continuous fluorescent troughs and cove lighting was used in some display areas.

The only new wiring required was circuit extensions from present outlets to new fixture locations in a few cases. Although the building is about 28 years old, the original wiring has plenty of capacity, the branch circuit conductors being No. 12. A 110/220 volt lighting distribution system is used with four distribution panels serving four evenly divided sections of each floor. The original circuiting is still maintained with two fixtures per circuit.

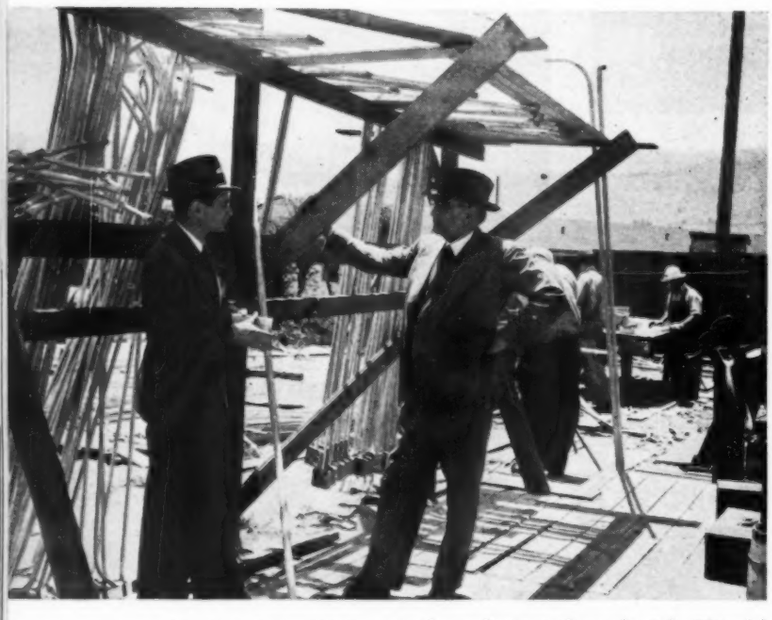
The third and fourth floors of the store have been completely relighted by Morganstern Electric Co., electrical contractors of Pittsburgh. Modernization of the other floors will follow.

Customers enjoy shopping under the 30 foot-candles of cool general lighting and are attracted to the 100 to 150 foot-candle displays in the merchandise cases. Department heads report quicker and more accurate sales because selection is easier under the new light. And employees complain less of eyestrain.

On one point the management has given definite instructions to its sales staff. And that is to caution the customers that merchandise bought under this improved light will appear different when viewed under the incandescent light in the home. This has done much to increase customer good will.

This 90 building — 772 apartment — California housing project was wired by prefabrication, mass production methods, with electrical work always stepping along ahead of time.

Mass Wiring F



H. C. REID, JR. AND SR. *at the makeup yard on the job. Material for the next day's building is being assembled, on the rack to their left, for subsequent distribution.*

MAKEUP YARD *at Sunnydale low-rent housing project, San Francisco. Materials are being prepared for installation in advance. Some of the project houses in the background.*

IT WAS a large-scale low-rent housing project comprising 90 two-story dwelling buildings under construction by general contractor, Barrett & Hilp. H. C. Reid and Co., San Francisco electrical contractors, when they started the wiring of the Sunnydale low-rent housing project in the Visitation Valley used the most modern mass production methods. All of the 90 concrete dwelling buildings except five and an additional administration and social center building are two stories in height. The project schedule called for the completion of the roughing of a building per day once the momentum was reached. A total of 772 apartments, each providing either two or three bedrooms, a living and dining room combination and a kitchen and bath, in multiples of 8 to 12 per dwelling building, required organization of materials and men for the job.

Each apartment is separately metered and has two circuits, one for lighting and the other for plug receptacles. The meter cabinet is on the outside end of each building, inset in the concrete wall. These buildings have concrete walls and floors with wood partitions and the roof framing surmounted by a flat tile roof.

In order to keep up with the general contractor's schedule, material was prepared and organized in advance at a makeup yard maintained by the contractor on the job. Material was taken to the job just ahead of the concrete pour and just behind the steel reinforcing crew. It was installed in the ceiling slab of the first floor. A second crew was organized to follow up with the roughed-in conduit work in the studding of the partitions.

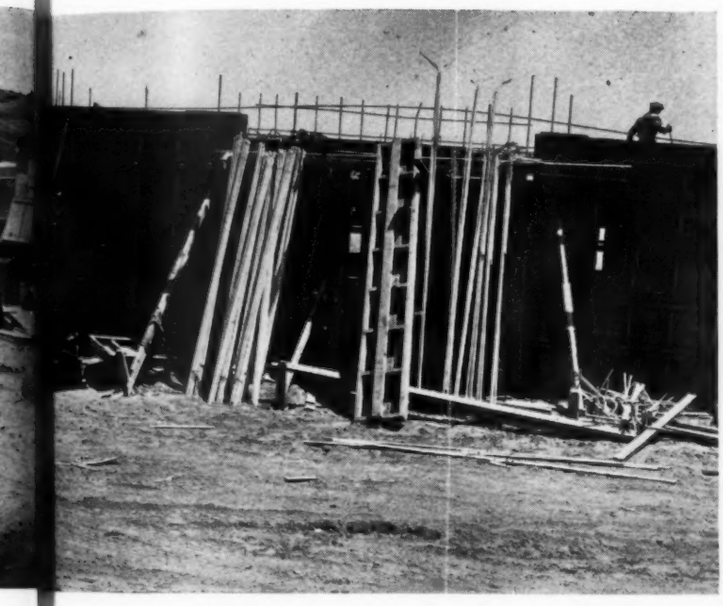
Then the entire bill of materials for the roughing-in of one building was counted out and delivered to each building in turn. Cutting and fitting on the job itself was reduced to minimum so unit costs were likewise cut. Similarly, when it came time to pull wire, a special crew was put on this job exclusively and again with the finish work. Quality materials were used, all circuits were in No. 12 wire, all switches were T-rated and all receptacles were duplex type.

Statistics of the job included 200,000 ft. of ½-in., 20,000 ft., of ¾-in. and 5,000 of 1-in. electric metallic tubing; 5,000 lighting outlets, 5,000 switch outlets and 5,500 receptacles. There was approximately 7,000 ft. of circuit wiring on the job.

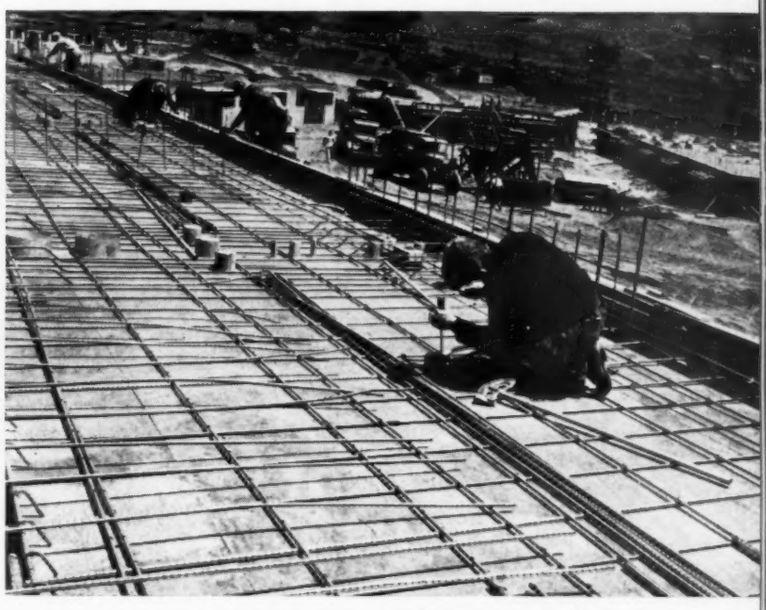
In addition to the wiring of the buildings, Reid and Co. built an overhead pole line distribution system for the project. It was placed in between alternate rows of houses and fed from Pacific Gas & Electric Company's 3-phase, 4-wire, 4150-volt Y system from which it was distributed as single-phase 3-wire to the individual houses. Also, an underground system for street lighting was installed using a standard San Francisco tapered tube steel street lighting pole with a G.E. 2500-lumen luminaire. Conduit was also installed for the underground telephone distribution system. In each apartment, conduit was also installed to make provision for telephone service.

The approximate total of the electric job was $100,000. The contract called for a time limit on the 91 buildings of about 14 months. But the general contractors were to finish in ten months.

For Mass Housing...



UNIT DELIVERY *of material for that house delivered to the job complete and ready to be installed in the forms before the day's pouring operations begin.*



BEFORE THE POUR *the electricians set the outlet boxes against the plywood forms. They are then connected by lengths of prefabricated conduit, delivered from the makeup yard.*

HOME RUNS *of metallic tubing assembled to enter the meter cabinet. The metallic tubing was installed in the floor forms at the end of the day ready for the next morning's pour.*

SUNNYDALE PROJECT *as seen from the first-story window of one of the apartments. These dwellings were erected one per day on a continuous mass production schedule.*

USE of ELECTRIC INSTRUMENTS

What instruments are needed in industrial plant operation and maintenance and where can they be used most helpfully.

By Frank C. Bobier
Engineer, General Electric Company

YOU can't lay down any hard and fast rules for the use of electric instruments in industry today. Their applications are too numerous and varied. And there are too many new uses presenting themselves. But operators of plants ranging from steel mills to bakeries are finding that instruments can be applied in many ways to safeguard production and save money. Let's take a look at some of the different types of instruments and see how they do their jobs.

Portable instruments, of course, are used for emergency testing and in maintenance. No plant should be without at least one portable indicating instrument. for in even the best plants trouble bobs up once in a while. A motor kicks out. A fuse or breaker blows. Machines act up. An electrical test of some sort is the quickest way to determine the cause of the trouble, and there's an opportunity for the portable instrument to come to the rescue. For the plant electrician without one, the cost of the delay in borrowing an instrument would have been sufficient to pay for a set. Then the next time trouble occurs, he has one handy.

Meanwhile, the portable instrument is more than earning its keep in maintenance service. Some of the jobs it can be used for in this work include:

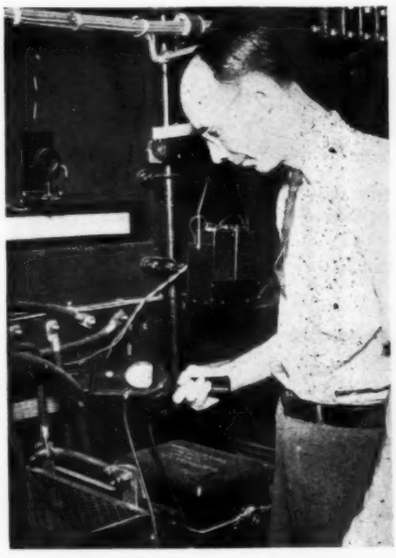
1. Voltage surveys throughout the plant.
2. Checking the condition of electric apparatus.
3. Locating weak spots in the electrical system.
4. Detecting electrical losses.
5. Testing the loading of motors. Underloaded motors waste power; overloaded motors may burn out.
6. Checking up on the lighting system.
7. Testing new equipment to see that it meets specifications.

Recording instruments—portable type—come into the picture when a permanent record is required and not just an indication of a condition. One of the most useful of these is the *recording voltmeter*. This instrument has many applications in the industrial plant. It can be kept continuously employed with no more effort than to change charts. Even the job of inking the pen can be avoided with some of the modern recorders known as the inkless type.

An important use of this instrument is in connection with the regulation of feeders. The chart it provides on voltage at the end of feeders can be compared easily with the switchboard log sheet or substation voltmeters. This helps maintain good regulation and forestalls voltage drops which would increase line losses. Voltage drops, of ten per cent or more below normal, cause reductions in motor speed and overheating.

[Continued on page 48]

VOLTAGE CHECKUPS *can be easily made with the ordinary portable voltmeter.*

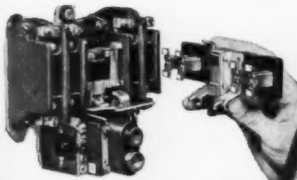


DOUBLE DUTY *clamp-on type of instrument indicates current on one setting and voltage on the other.*

RECORDING AMMETER *permanently indicates the load cycle on this large motor.*

Everything's *Covered* with Dust *Sir*

Dust is always a nuisance, but it's something far more serious when it interferes with the performance of motorized machines in these days of top-speed production. Thus Cutler-Hammer Motor Control is a doubly important asset NOW. *This* Motor Control uses dust-safe VERTICAL contacts exclusively . . . VERTICAL contacts that *can't* collect dust and dirt . . . VERTICAL contacts that *stay* clean to work *better* and last *longer*. Its recognized record for dependable performance is proof of this outstanding superiority in design and construction. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

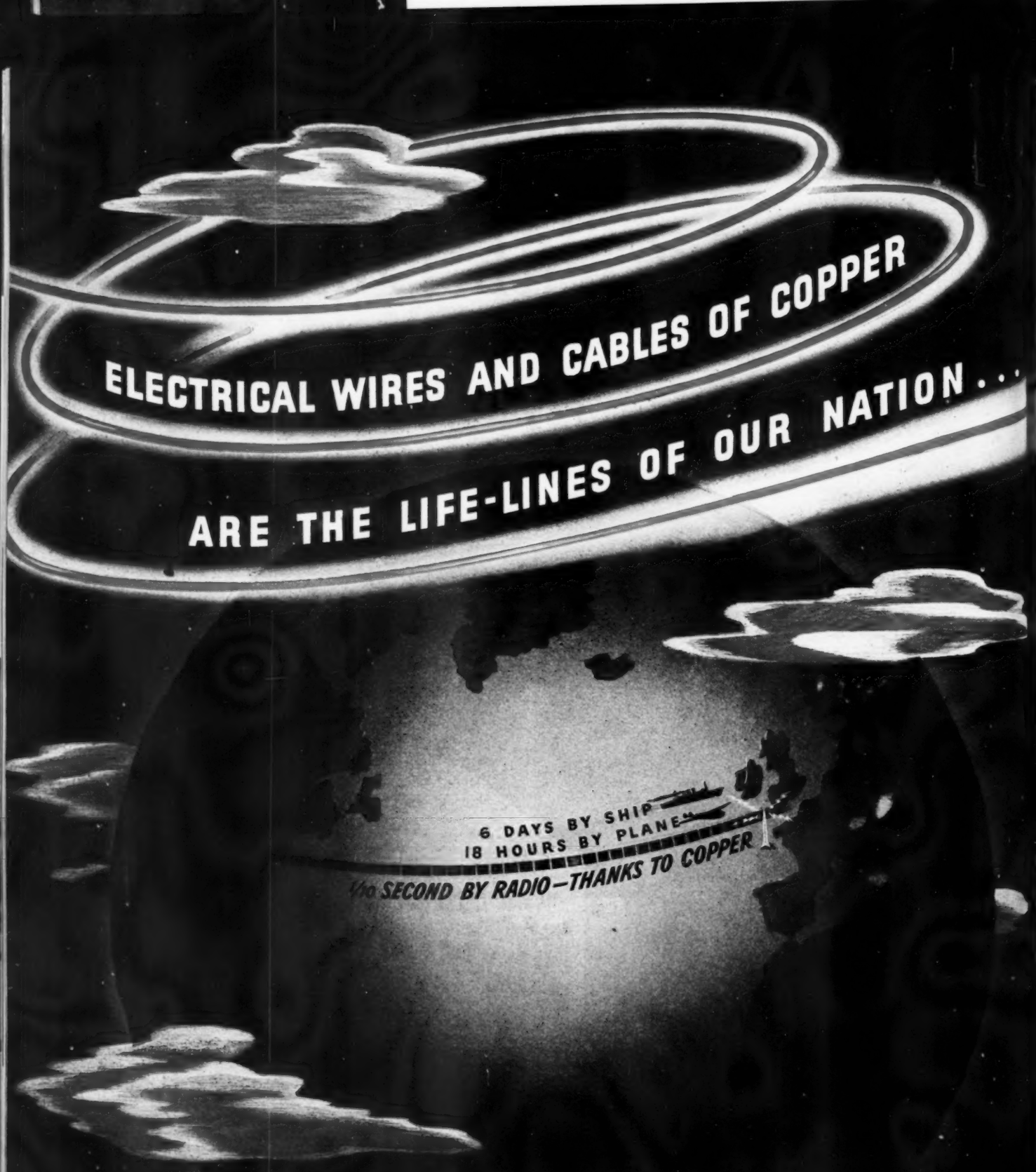


Cutler-Hammer *Vertical* Contacts are the mark of *better* Motor Control, another extra dividend on Cutler-Hammer's unequalled specialized experience and decades of Motor Control leadership.

Getting down old records is always a dirty job . . . for dust settles on horizontal surfaces everywhere whether these surfaces are shelves in an office or parts inside motor control in a factory.

CUTLER-HAMMER
MOTOR CONTROL
C-H

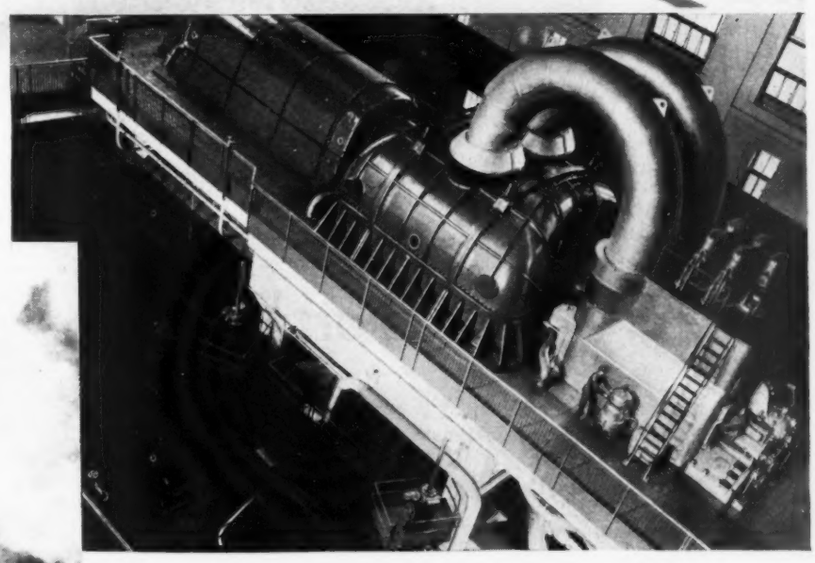
Dust Safe VERTICAL *Contacts*

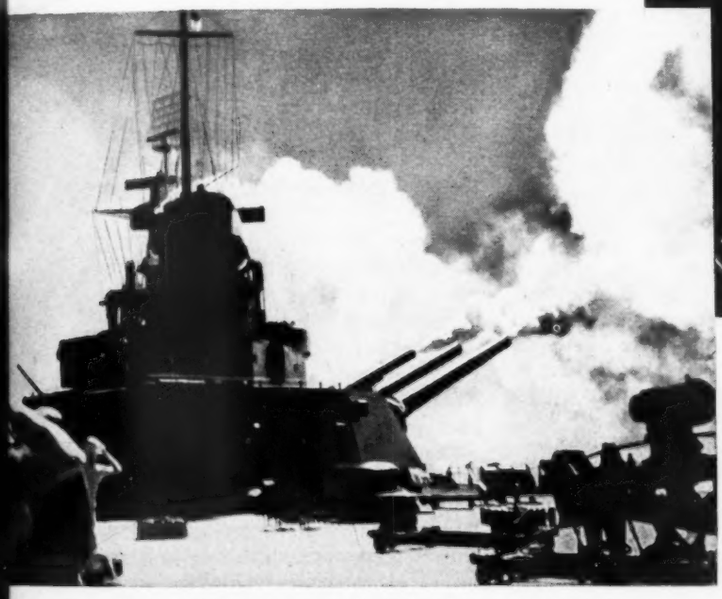

ELECTRICAL WIRES AND CABLES OF COPPER
ARE THE LIFE-LINES OF OUR NATION...
6 DAYS BY SHIP
18 HOURS BY PLANE
1/10 SECOND BY RADIO—THANKS TO COPPER

THE ATLANTIC—1/10 SECOND WIDE... Lightning communication between Hitler's enemies and America owes its birthright to copper ...radio telephony, direct wire communications, both depend on electricity... and there's one best conductor of that vital force... COPPER.

CARDS ON THE TABLE. Our company is working night and day turning out electrical wires and cables for defense purposes and where possible diverting as much as we can for ordinary civilian requirements. The laboratories are working with equal speed and diligence ... producing improvements in regular products and creating new and better products. Most of them are being rushed into defense work with the result that until peace comes you may be denied their advantages. But, when that day does come, Anaconda wires and cables, better than ever, will be ready to go to work for you.

IN DEFENSE... IN INDUSTRY!





WHERE DEFENSE BEGINS. Airplanes make the headlines and tanks and battleships make the rotogravure sections, but there's something that must come first ... and that's the power to turn them out. *Power* is basic. It makes wheels turn, it is essential to American industry. From gigantic turbines like this one, amazing amounts of electrical energy are transmitted to war-essential industries through copper wires and cables. Without the copper conductors, power would be bound and immovable.

FIRST IN THE EYES OF THE WORLD. American aviation produced not only this giant, the Douglas B-19, but also faster pursuit planes, interceptors with lightning climbing speed and dive bombers that out-Stuka the Stukas. In each, there is a network of copper wires and cables carrying electricity to delicate flying instruments, to ignition systems that fire motors turning up over 1600 Hp. In the B-19, for example, there are seven miles of copper wires and cables.

SPARKING 2 1/2 TONS OF TNT. Nine 16" rifles and ten five-inchers belch 10 tons of steel from the U.S.S. North Carolina. 2½ tons of TNT exploded in order to hurl this lethal barrage. Copper cable carried the electrical impulse to the firing point; copper wired fire alarm systems stood "at the ready" in case of emergency. In fact, over 2,000,000 pounds of copper were aboard the "Ency" performing scores of vital tasks to help make it the most powerful war vessel afloat.

THE VOICE HEARD 'ROUND THE WORLD. It's the voice of American industry. It directs the gigantic defense effort through copper wires and cables ... through the telephone ... through plant intercommunication systems ... in fact, through a network of copper nerves. And when the voice said "full speed ahead," the ears of the world listened attentively, eagerly. 41277

Anaconda Wire & Cable

ANACONDA

Anaconda Wire & Cable Company • General Offices: 25 Broadway, New York City • Chicago Office: 20 North Wacker Drive
A Subsidiary of Anaconda Copper Mining Company • Sales Offices in Principal Cities

For Forty Years

MY GREAT-UNCLE DAN WAS A PIONEER ELECTRICIAN. He was the spitten image of your Uncle Sam in Washington—goatee and all. But he didn't dress that way. He was a starry eyed inventor with a grimy thumb. For years he lived three jumps behind a fortune and one ahead of the sheriff.

I SPENT THE SPRING OF '89 with Uncle Dan. He tinkered with his batteries and bells, his lamps, sockets and switches, in a little back yard shop under a chestnut tree. And when the groceries ran low he wired a few houses. Like most electricians of his day, he worked alone, with few rules and lots of trial and error.

IN ANOTHER DOZEN YEARS the electrical construction business grew up. Industry and commerce—and even some homes—began to put electricity to serious use. And men in this fascinating new business began to seek ways of exchanging experiences, of learning from the successes and failures of their friends throughout the electrical industry. So in November 1901, the first copies of this magazine rolled off the presses.

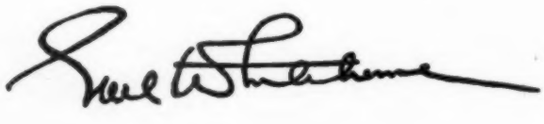
WE KNOW WHAT OUR INDUSTRY has done in the forty years that end this month. It has taken the products of a thousand manufacturers, hired the labor of skilled craftsmen and gone ahead with the wiring of a continent. Scores of contractors have become leading electrical manufacturers; thousands have helped develop new products, or shown manufacturers how to improve old products.

THIS IS OUR FORTIETH BIRTHDAY. We aren't publishing a "special issue". We aren't asking for a big birthday cake, all full of candles. We think we are too grown up to need them. But we are asking that the rest of the electrical industry face the plain fact that contractors and industrial plant electrical men need a present —in the form of every bit of help they ask for in carrying through the defense program.

PAST HISTORY doesn't count right now—except that quality of work, and integrity of character will always distinguish some men from some others. Future history *does* count. And that future will be determined by the way in which our whole industry works together today. We are learning much about the true meaning of Adequate Wiring—of Better Light Better Sight—and all of the other things of that sort, right in the process of defending America. We are learning things that will help us in the years to come.

THE NEXT PHASE IN OUR PROGRESS may well lie in the field of simplification, standardization, coordination between all parts of the industry, a better mechanical technique, and better creation of markets. Who knows? But life is change and we will still be changing with it. Let's do it under our own steam. Let's plan it—and not just be pushed along. We're the Uncle Dan's of 1941.

• This editorial was written a few days before the death of Earl Whitehorne



Priorities Are Law

Some contractors are going to be hurt. Some may be forced out of business, even, because of strict priority and allocation rules. But priority rules are the law. Martin of O.P.M. warned contractors at the Houston convention to "Run your business under the rules."

Our nation is committed to a defense program. The need for additional restrictive legislation, laws and rules will depend upon the degree of cooperation from business. With the national security at stake, there can be no half measures.

It is not the intent of the new rules to wreck going concerns but to swing the total national economy over to one big job. The electrical construction industry is sufficiently flexible to make the necessary transition with a minimum of lost motion and lost volume.

Most well established contractors have been hard at work on industrial remodeling and on maintenance in the thousands of plants too small to employ a full-time electrician. A reduction in the volume of their non-defense work will mean loss of jobs for some of their workmen who have been busy on non-defense work. This will be temporary until their journeymen find new jobs on defense work. Large scale highly organized maintenance, in which industrial plant electrical engineers and industrial electrical contractors continue to figure so largely, of course, will continue on a high scale.

The only men who will be seriously hurt it appears are the small contractors who have specialized in wiring speculative houses and small commercial work. But in recent months, more and more of these one man operators have been going to work as plant electricians. Here they are finding that their knowledge and experience in electrical construction is bringing them more money in their pay envelopes than they ever made as small contractors on their own.

Ghosts Laid

L. K. Comstock laid some ghosts that have haunted many critics of the National Council for Industrial Rela-

tions. The fear that contractor members will not oppose union demands because they have to get along with their locals is unfounded. "No case of retaliation has ever come to my attention. If this occurred the Council could not have lived for 21 years," he bluntly stated.

The Council has adopted the theory that the fundamental interests of employer and employee are identical. If that theory were more widely followed in all industry thinking by labor and contractor alike there could be a lot more plain and open speech about labor relations—and maybe less need for it.

Apprentice Training—At Last

Ed Herzberg reported at Houston the results of a series of meetings with IBEW and government apprenticeship training experts. At last, the electrical contracting industry has an apprenticeship standard. It is a good standard, set up to be operated by joint local committees of contractors and union representatives.

Under pressure of the growing shortage of skilled mechanics, the committee acted with commendable speed. The next step, however, needs equally vigorous action. The standards must be approved locally and local joint apprenticeship committees organized. It should be easy, now that a sound policy has been set with the blessing of both NECA and IBEW.

Engineering Sales

George Mateer, who authors the NECA sales manual, sprung an important sales campaign at Houston. Plant surveys with instruments and a methodical presentation in sales language the buyer can understand, backed by sound engineering analysis will sell wiring, he claims. A handful of smart contractors have been doing just that, successfully, for years.

What the broad results of an all industry campaign with every contractor telling the same sound engineering story, divorced from "price" and "minimum code", would be, no one knows. But it certainly would create new markets and higher standards. It can't be done overnight but there is a solid foundation in Mateer's engineering sales plan for the future.

Cheap at any Price

Electrical construction figures still rank far down the list compared with the work of other trades. But the lighting and wiring system ranks higher in importance in the finished building.

At a recent convention of office building managers, rewiring with small diameter wires and a study of lighting methods were prominent on the program. Easily 25 percent of the exhibitors displayed equipment depending on electric wiring for operation.

When buildings are built, the emphasis is on major structural features. But building managers have the job of leasing and using space. Lighting and available electrical facilities are vitally important to them.

Housing—New Style

Washington tells us that 571 local or regional housing authorities are now operating under the Federal Government program. In 38 states they are at work building houses to help people secure better homes at small cost. The movement is just starting.

In the aggregate this is going to mean a vast volume of electrical wiring in the next ten years. What is it going to mean to you? Will you have a part in this new kind of building? Or, will you stand aside because the procedure is different from what you have been accustomed to?

But the whole world is now changed and men must change with it. There is a problem here, therefore, that every electrical contractor should face and understand and deal with to his own real interest.

Back Talk

Guidance Needed

To the Editor—"I agree that electrical contractors are not responsible for some of the inferior fluorescent lighting equipment which has been and still is being sold. To some extent, we are experiencing the same sort of competition which has at various times plagued the incandescent lamp industry.

"There are aggressive electrical contractors and we know there are contractors who are not aggressive. Those in the latter group frequently stress price and expect price to do the selling of the job for them. It is this segment of the contracting fraternity that has been responsible.

"I am afraid that your suggested cure is not the complete answer. Unfortunately, the utility companies cannot speak out without being subject to criticism. But you have directed attention to a matter which merits the study of all the members of the electrical industry."

D. A. Hill
Ohio Public Service Co.
Cleveland, Ohio

We see no reason why the power company can't speak out to warn the public against buying fluorescent units that do not fit the needs, and stress the fact that when you buy this equipment you are making an investment in a new kind of lighting. The public looks to the utility company for such guidance in matters electrical—and this includes the lighting art.

Industry Peace Program

To the Editor—"Your editorial 'Perils Ahead' strikes home again. I always like what you have to say, and the way you say it, but this time you lay a very real suggestion at the doorstep of the electrical industry.

"I believe the whole industry would favor a Joint Peace Program Plan. So many utilities, manufacturers, wholesalers, and electrical contractors show lack of real interest for their defense business, simply because they are thinking ahead to sub-war period and the problems they must ultimately face.

"Don't you feel that a joint plan should strive toward more coordination of selling effort than has been demonstrated between all branches of the industry in the past? We are, of course, concerned with the development of every potential market—and campaigns to sell them, but unless we can plan it so that the cost of selling will also be reduced, very little progress will be gained, in the end, by the industry.

"Your idea for this Joint Peace Program Committee is right. Please accept my congratulations for hitting another bulls-eye."

G. D. Mateer
Philadelphia, Pa.

Sales must be the very heart of it. But before sales will bulk large in a situation like this, there must be much deliberate and determined planning. It calls for a strong industry joint committee that will review the whole problem of what to do to sustain the electrical industry when peace comes suddenly and war production ceases, and actually organize campaigns ready to move, with markets defined and companies committed.

Fluorescent Lighting

To the Editor—"We have been disappointed in the performance of fluorescent fixtures we have installed. And the most of our trouble seems to come from loose connections in sockets. We think some method should be devised that would give a firm positive connection to the tube terminals. Possibly a set screw for each pin or similar connection would suffice. We feel that this is a very important problem that should be solved at once.

"Thanks for going to bat for us in your recent article on who is to blame for present troubles—it has been my contention for years that the electrical contractor is the step-child of the electrical industry, who gets called in to clean up the mess created by the gravy grabbers."

Daniel Craton
New Orleans, La.

It does seem so at times, and the reason is that the contractor has been too slow to express his opinion in an organized way. We believe we're going to see more active registering of contractor purpose and policy in the future.

Modern Lighting

DIRECT FLUORESCENT OFFICE LIGHTING

Careful preliminary studies of all influencing factors and skillful planning to achieve a unity between design, function and fluorescent illumination is evidenced by this streamlined office of Dovenmuehle, Inc., in the Field Building, Chicago, Ill.

An average of 49 foot-candles of illumination is provided on the working plane in this 66-ft. by 68-ft. room. Permaflector fluorescent troffers, equipped with a single row of 40-watt, 48-in. white F lamps, are mounted flush on 5-ft. centers in the 11-ft. ceiling. Where required to fill out a continuous run, 15-watt or 20-watt lamps were used.

***FLUORESCENT TROFFERS** combine with skillful modern designing to achieve a unity between design, function and lighting in this streamlined office.*

The troffers are equipped with a special frame construction designed for installation with snap-in acoustical ceilings. The units are snapped into position between standard 12-inch blocks of acoustical material. They are then butted end-to-end and overlap to form a continuous closed channel. Flutex glass panels, installed in the bottom of the troffers, conceal the lamps and housing, diffuse the light and reduce the surface brightness from the lamps. The total installation figures to 1.6 watts per square foot.

All accessories and colors in the room were pre-tested before selection to establish their appearance under fluorescent white illumination. The walls and venetian blinds are painted a reddish brown to add a warm note to the cold light and the flooring is a rubber tiling of light warm tan which has a high reflectivity. The acoustical ceiling is finished in white enamel.

OUTDOOR PROTECTIVE LIGHTING

Protective lighting is employed to aid in guarding the grounds and equipment at Camp Haan, new anti-aircraft firing training center near March Field, California. The lighting system also helps to expedite night maneuvers and minor repair work.

Pendant street lights, of a type recently developed by G. E. engineers to provide more accurate control of light distribution and resultant ground illumination, are used. A total of 262 of the Form 79-VR units with 500-watt incandescent lamps, extend the length of the equipment parking area. The units are mounted 23 feet above the ground on poles spaced 110 feet apart. Overhead open wiring feeds the units.

***LIGHT GUARDS** vital defense areas and equipment at this anti-aircraft training center in California. Pole mounted pendant street lights extend the entire length of the equipment parking area.*

COLOR MATCHING BOOTH

The booth shown below could be used in any industry or commercial enterprise where color matching is an important phase of the manufacture or sale of a product.

This particular installation consists of twenty-four 36-inch daylight fluorescent lamps arranged in two banks of twelve units each and controlled by three circuits. The foot-candles obtainable are 150, 350 and 500.

As can be seen from the illustration, the inspector stands fairly close to the shield which cuts off any direct view of the light source itself. It is also possible for him to move his head about throughout a considerable area without receiving any specular reflection from the material being checked.

To minimize the possibility of reflec-

WESTINGHOUSE supplies the answer

"HIGH VISION" Luminaires for High-Speed Seeing and Production

Westinghouse Type FPS "HIGH VISION" fluorescent luminaires answer industry's own demand for higher lighting intensities and quicker vision; an extended light source for better distribution; a flexible system for changing production needs; a cooler light with low brightness and greater efficiency.

These luminaires combine the economical benefits of fluorescent lighting with end-to-end mounted, porcelain enameled reflectors. They use either two or three 40-watt fluorescent Mazda lamps in each reflector and may be extended as continuous lines of light as far as desired.

Providing intensities of 100 or more footcandles, Westinghouse "HIGH VISION" lighting units comply with RLM specifications, and are so labeled. Continuous runs of "HIGH VISION" luminaires will supply the answer to today's high intensity lighting needs and tomorrow's too. Ask your local Westinghouse Lighting Distributor for folder, F-8654. Or, write Westinghouse Electric & Manufacturing Co., Edgewater Park, Cleveland, Ohio.

★

"HIGH VISION" Fluorescent Luminaire for Continuous Runs of High Intensity Industrial Illumination.

★

Continuous Lines of Light Meet Changing Industrial Needs . . .

The channel for the Type FPS luminaire serves as a continuous wireway and has all of the auxiliary equipment mounted in and wired as part of the complete assembly. It provides for future additions of ballasts, sockets and reflectors as industrial production operations change. Continuous lines of reflectors are secured to the channel by a simple turn of two tension-locked thumb latches; no tools are required. "HIGH VISION" units provide high power factor of 92 to 99%, minimized cyclic flicker and satisfactory lamp performance.

117 Westinghouse Electric Supply Company offices and independent Lighting Distributors provide local stocks and services.

Westinghouse LIGHTING EQUIPMENT

IT WORKS LIKE MAGIC!

...and yet no magician ever pulled anything out of his bag of tricks so amazing as today's rapidly expanding fluorescent lighting market. Your opportunities for cashing in on this market are hotter than ever before! 250 million dollars is the estimated expenditure for fluorescent lamps, fixtures, and installations this year. In 1940 it was under 100 million. These figures include no expenditure for production expansion. At the present growing rate the first billion-dollar year is not far off. Now is the time to get your share of this vitally important business . . . not only to increase present sales but as a foundation for the years ahead. Read how on the opposite page!

7 WAYS TO GET YOUR SHARE OF THE FLUORESCENT LIGHTING MARKET

IS YOUR LIGHTING BUSINESS UP 50%? If not, you aren't getting your share of the biggest business in all history . . . right now when fluorescent lighting is booming. The 7 tested selling ideas listed below will help you develop your fluorescent lighting business . . . and go a long way toward doubling and tripling your sales and profits on G-E MAZDA F lamps and fluorescent lighting equipment. As you read over this list of tried-and-tested ideas, they sound a lot less like magic than good common sense. They've already worked wonders for lots of electrical contractors; they should work for you!

---

1. SELLING FLUORESCENT lighting is easy with the right set-up. That includes stocking a line of Certified Fixtures such as Fleur-O-Lier or RLM for commercial and industrial applications, a good line of the more popular fixtures for the home, and an ample supply of G-E MAZDA F lamps for your lamp stock. Order a stock on your regular G-E lamp contract.

2. MANY ELECTRICAL CONTRACTORS have found that installing 50 to 100 footcandles of fluorescent lighting in their own display rooms and offices is an effective way to make their business places really look like "Fluorescent Lighting Headquarters". Are you doing this?

3. UP AND COMING CONTRACTORS after extra profit are soliciting fluorescent lighting business from small stores and industries in their neighborhoods. Are you getting a larger share of the market in this way?

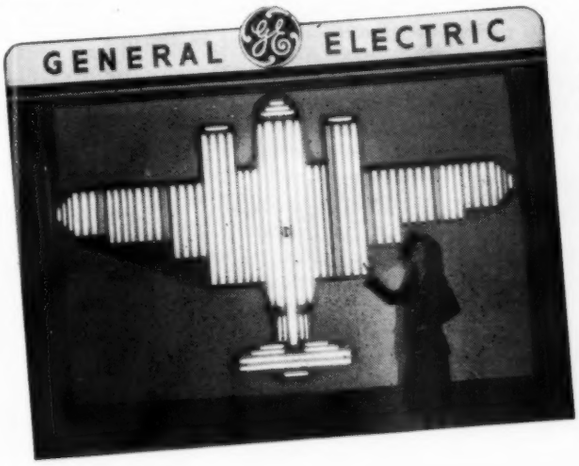
4. TEST CAMPAIGNS in newspapers and by direct mail have shown that many worthwhile leads can be developed by these methods. G.E. has available many suggestions for local advertising including complete mats and direct mail pieces. Have you tried these?

5. F LAMP RENEWAL BUSINESS is beginning to come in fast. By the end of this year about one lamp in every four shipped will be for renewal purposes. Are you set up for this business on every job you have sold as well as for those which someone else has sold? Do you have stocks on hand and do you inquire about fluorescent renewals in your regular daily contacts?

6. MANY ELECTRICAL CONTRACTORS report that the use of the Footcandle Selectometer along with the Light Meter is most effective since it lets customers determine for themselves how many footcandles they would like to have for better seeing. Are you using both of these devices to help you sell more fluorescent lighting? G.E. can supply you with both Selectometers and Light Meters . . . as well as other tools.

7. CASH IN ON G-E MAZDA F QUALITY lamps. When you sell fluorescent lighting with G-E MAZDA F lamps you are simply following public preference for products that carry the famous mark of G-E quality. Remember that since G-E MAZDA F lamps were introduced in 1938, their efficiency has been increased as much as 40% and prices have been reduced as much as 52%.

For complete information on developing your fluorescent lighting business, see your General Electric Lamp Division Office.



General Electric offers you a full line of 59 sizes and colors of MAZDA F lamps and two types of RF (rectified fluorescent) lamps, as shown in this photo. MAZDA F lamps are available in several wattages from the small 6-watt to the 5-foot 100-watt in 3500° white and daylight; and in certain sizes in soft white and several brilliant colors. RF fluorescent lamps, designed primarily for industrial use, are available in two colors, blue-white and industrial-white.

GENERAL ELECTRIC COMPANY
NELA PARK, CLEVELAND, OHIO

GENERAL ELECTRIC MAZDA

New and improved No. 90 Floodlight of seamless construction.

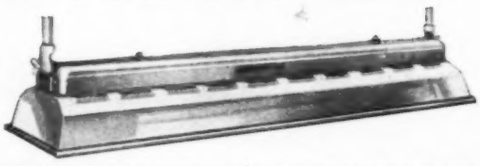
AROUND defense plants, floodlighting is an effective barrier which safeguards property and life against saboteurs.

Ideal for this purpose, the new Goodrich No. 90 Floodlight, of seamless construction, provides still greater efficiency in illuminating large areas uniformly. It's finished in permanent porcelain enamel, weather-proof, rugged; equipped with rust-proof ventilated hood for pole or bracket mounting. Ask for catalog sheets.

GOODRICH
INDUSTRIAL LIGHTING

GOODRICH RLM

HILLCREST FLUORESCENT FIXTURE —an exclusive Goodrich design with top apertures which create "daylight" conditions.



SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

[FROM PAGE 38]

tion from the source to the eye, by means of the material, the lamps are confined to a small solid angle. And the top and part of the back of the booth are painted black. This is the part of the booth from which light is reflected

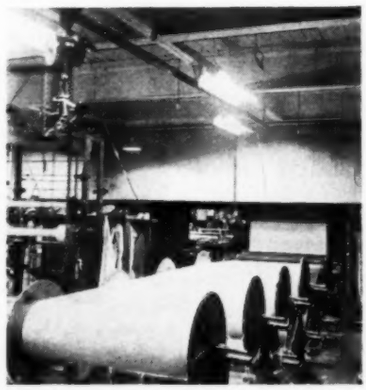
***FOR COLOR MATCHING** a booth such as this enables the inspector to make more accurate color comparisons with much less eye strain. Booth is so designed that disturbing light reflections are eliminated.*

to the eye of the inspector, by the surface of the material examined.

Although this is a demonstration booth with both fluorescent and incandescent lighting units, the same principle could be incorporated into booths built for actual productive uses.

SLASHING

This view shows threads going into sizer which sets between front and back sections of machine at the Uxbridge Worsted Company, Uxbridge, Mass. Three Miller Fluorescent units are



***LIGHTING FOR SLASHING** in this worsted mill is accomplished with direct fluorescent units providing 25 footcandles at the working plane.*

Why You Should INSIST...

On Industrial Fluorescent Units
CERTIFIED BY RLM

This simple buying step is your best assurance that the Industrial Fluorescent Lighting Units you install will provide the maximum value in lighting efficiency and economy . . . will deliver the balanced lighting so essential to maximum output of National Defense Products . . . will protect the welfare and promote the efficiency of employees called upon to work longer hours and at higher speeds.

Specifications for Certified RLM Industrial Fluorescent Units have been established by extensive research and scientific tests. Conformity to RLM Specifications by all RLM labeled Industrial Fluorescent Lighting Units is assured by a rigid and continuous inspection and testing system conducted by Electrical Testing Laboratories.

Thus, the RLM LABEL becomes the user's warranty that the fixtures, auxiliary control equipment, sockets and other component parts of the Lighting Unit bearing it are properly engineered for co-ordinated operation with Mazda Fluorescent Lamps to give maximum light output and trouble-free operation. Write for copies of RLM Specifications.

RLM Specifications
Industrial Fluorescent Units

Specification No. 5: 48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit.

Specification No. 6: 48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit.

Specification No. 7: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit.

Specification No. 8: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Diffuser Unit.

Specification No. 9: 48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit.

Specification No. 10: 48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit.

Specification No. 11: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit.

Specification No. 12: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit.

Guarantee

All RLM certified fluorescent lighting units are guaranteed against mechanical and electrical defects for a period of ninety (90) days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or its distributor.

RLM certified fluorescent lighting units are engineered for operation with Mazda fluorescent lamps to give maximum light output and trouble-free operation when properly installed and under normal conditions of use.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.

QUAD
LIGHTING UNITS

FOUR THINGS TO REMEMBER

1 53.4% of all jobs done by contractors involve the installation of lighting fixtures

2 Modern industrial lighting requires both Fluorescent and Incandescent lighting

3 QUAD's high quality materials and reflecting surfaces are equally important on both incandescent and fluorescent units

4 QUAD RLM and other porcelain enameled lighting units all have correct basic design and construction features offering you the finest in Industrial Lighting Equipment.

QUADRANGLE RLM

NO. 1184-M
RLM THREADED DOME REFLECTOR

QUADRANGLE MFG. COMPANY
Mfgrs. of Incandescent and Fluorescent Lighting Equipment
32 SO. PEORIA ST. CHICAGO, ILL.

Modern Lighting

[FROM PAGE 42]

spaced over machine 10 feet above floor on 8 foot centers, 6½ feet above working plane. Illumination is 25 foot-candles at working plane. White lamps are used.

NEW LIGHTING AT SKIDMORE COLLEGE

This famed girls' school located at Saratoga Springs, New York, has a new 'troffer" installation that places it in the category of best lighted

STUDY AT SKIDMORE is a pleasure in this well lighted room. Fluorescent troffers provide 35 foot-candles of well diffused cool illumination.

schools. The room shown is 34-ft. by 75-ft. with a 14½-foot ceiling. There are 12 rows of units equipped with 40-watt fluorescent lamps. These are spaced 6-feet apart. Thirty-five foot-candles are produced.

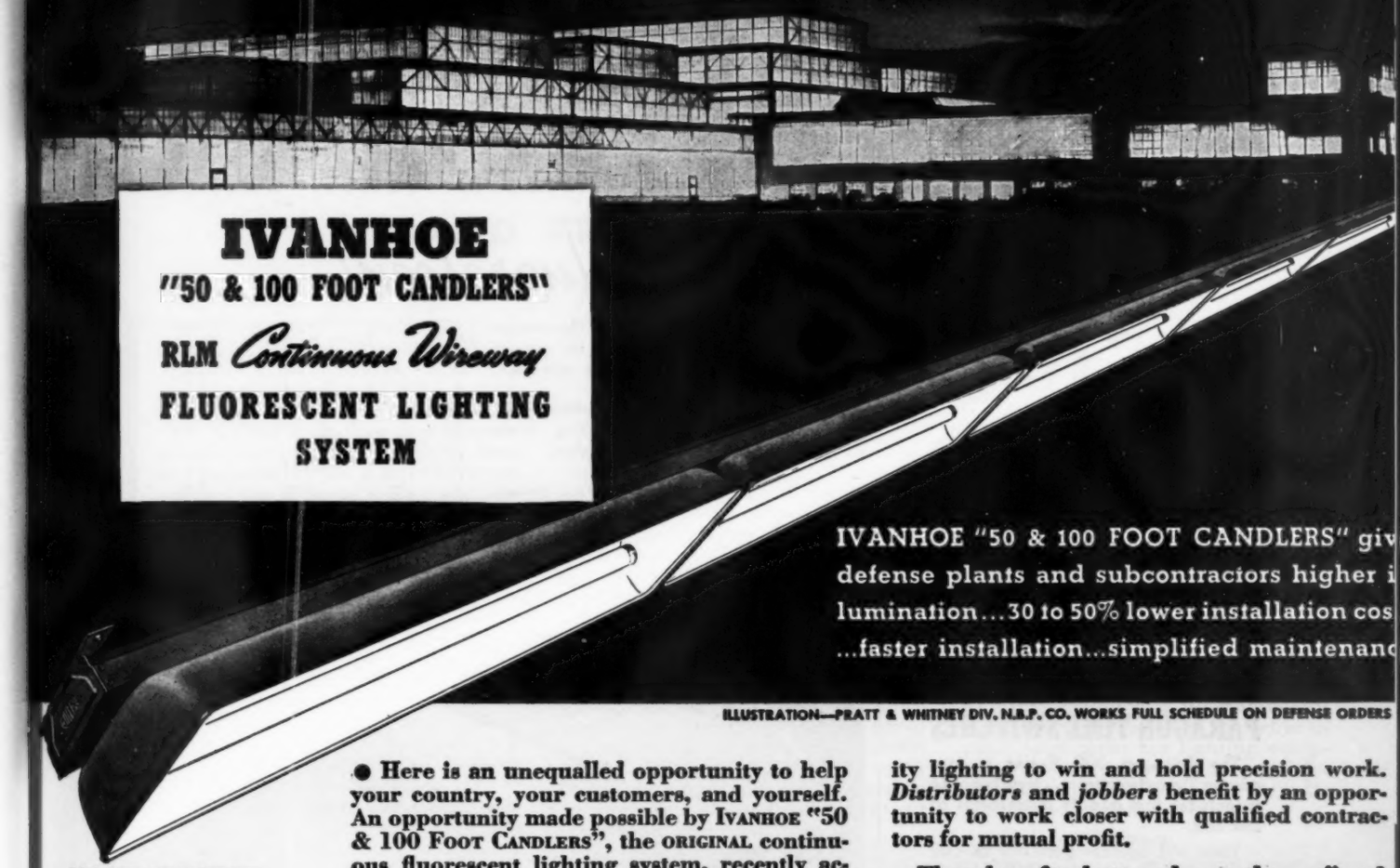
LIGHTING A HOTEL FESTIVAL ROOM

This outstanding lighting installation creates a fine effect on the wall panels of the Festival Room, Hotel Oxford, Denver, Colorado. Thirty-watt fluorescent lamps are placed at the ends of each panel along the walls, shielded from direct view and illuminating the panels which are of sand-blasted "Nu-Wood," depicting internationally famous festivals over the country.

A total of 50 lamps were used in fluorescent Curtistrip and the entire effect is exactly what Charles Jake, the architect, and the owners wished to achieve.

TO MEN INTERESTED IN HELPING DEFENSE WITH BETTER LIGHTING:

Nothing less than this Proven and Guaranteed fluorescent lighting system will do today



ILLUSTRATION—PRATT & WHITNEY DIV. N.B.P. CO. WORKS FULL SCHEDULE ON DEFENSE ORDERS

MILLER-IVANHOE INSTALLATIONS

Springfield Armory • Frankford Arsenal • Curtiss-Wright Corp. • Grumman Aircraft • Republic Aviation Corp. • Fairchild Aviation • DuPont Company • Eastman Kodak Co. • Hercules Powder Co. • Liberty Aircraft Products • Uxbridge Worsted Co. • Sperry Gyroscope Co. • Ranger Engineering Co. • Pratt & Whitney • United American Bosch • New York Shipbuilding • Combustion Engineering • United Aircraft • The Austin Co.

●

IVANHOE "50 & 100 FOOT CANDLERS" offer . . .

HIGHER ILLUMINATION—50 to 100 foot candles—for faster, better production—greater worker efficiency.
30 TO 50% LOWER INSTALLATION COSTS—Fixtures contain up to 80% of necessary conduit—make defense dollars go further.
FASTER INSTALLATION—Steps up building schedules—plants get into production quicker.
UNIFORM LIGHT DISTRIBUTION—Production equipment can be moved at any time without necessity for changing lighting.
SIMPLIFIED MAINTENANCE—Easy to clean, removable porcelain-enamel reflectors—save valuable man-hours for production.
ALLOWANCE FOR FUTURE LIGHTING NEEDS—Illumination increases up to 45% practical without new fixtures—lower obsolescence.

● **Here is an unequalled opportunity to help your country, your customers, and yourself. An opportunity made possible by IVANHOE "50 & 100 FOOT CANDLERS", the ORIGINAL continuous fluorescent lighting system, recently acclaimed by lighting experts as "*the new lighting standard for industry.*"**

IVANHOE "50 & 100 FOOT CANDLERS" are guaranteed and *proven* . . . proven by more than two years of service in America's armories and arsenals, aviation plants, precision instrument companies, defense plants of all kinds.

No other fluorescent lighting equipment wears such service stripes . . . offers such noteworthy benefits to buyer and seller alike.

***Users* benefit by better working light, speedier output, and lower production costs. *Utilities* benefit by increased load—better lighting standards. *Contractors* benefit through more jobs—particularly today in defense subcontracting plants which must have high quality lighting to win and hold precision work. *Distributors* and *jobbers* benefit by an opportunity to work closer with qualified contractors for mutual profit.**

These benefits, buttoned on to those offered by MILLER TROFFERS (see below) for office lighting, give you a proven, guaranteed, and *complete* "lighting package" for helping customers today. Write for full facts.

Prompt Deliveries—Superlative Service

We are constantly striving to keep deliveries moving smoothly, fast and ahead of building schedules. And no major installation goes in without a Miller engineer on the scene . . . to live with the job until it is operating at maximum efficiency.

For Offices, Drafting Rooms and Similar Installations . . . Use Miller Troffers

MILLER TROFFERS—continuous recessed fluorescent lighting system — are ideal for offices, drafting rooms and even factories with acoustical or other hung ceiling constructions. Proven and guaranteed, they, too, are providing better light and increased worker efficiency for many progressive organizations. More than 25 miles of MILLER TROFFERS are in service today. Ask for Bulletin 20.

THE MILLER COMPANY

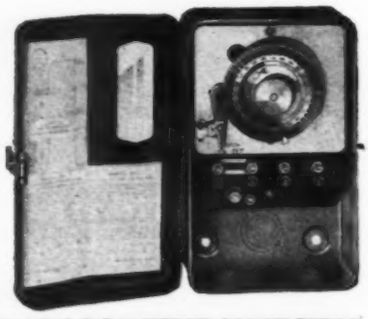
MERIDEN, CONN.

Pioneers in Good Lighting Since 1844

• MILLER OFFERS A COMPLETE LINE of incandescent and fluorescent lighting equipment, backed by almost 100 years of commercial and industrial lighting specialization. There is no answer to your problems in this unbiased lighting service.

Tops

IN TIME SWITCH QUALITY FOR ONLY $13.00 List



PARAGON TIME SWITCHES

The Paragon 300 Series is tops among Time Switches . . . tops because it includes first quality instruments at low cost.

They will operate perfectly in any temperature ranging from 125 degrees Fahrenheit above zero to 20 degrees Fahrenheit below zero.

30 ampere rating—plenty of wiring space—sturdy clock train—snap-action switch—simple hand trip—attractive modern case—approved by the Underwriters Laboratories—covered by standard Paragon guarantee of satisfactory service, workmanship and material.

Offered by progressive sign and electrical supply jobbers at generous trade discounts.

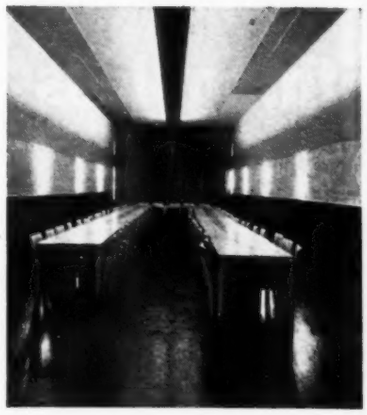
PARAGON ELECTRIC CO.
401 So. Dearborn St., Chicago, Ill.

Paragon
BUILDERS OF CONTROL INSTRUMENTS SINCE 1905
Chicago

Modern Lighting

[FROM PAGE 44]

General lighting is provided by means of two rows of fluorescent lamps behind Nu-Wood panels on the ceiling.



PANEL LIGHTING in this hotel festival room is provided by concealed fluorescent units at each end of each panel. Indirect general lighting is provided by concealed ceiling fluorescent strips.

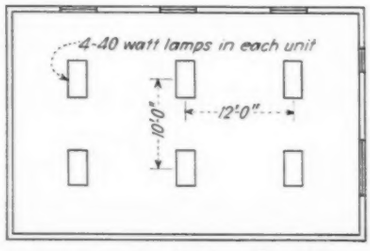
Lighting a GENERAL OFFICE *Fluorescent*

PROBLEM—To provide uniform illumination of adequate intensity and quality for general office work and business machine operation.

CONSTRUCTION DATA—The office is 25 by 39 feet, with an 11-foot ceiling. Walls and ceiling are finished in light colors.

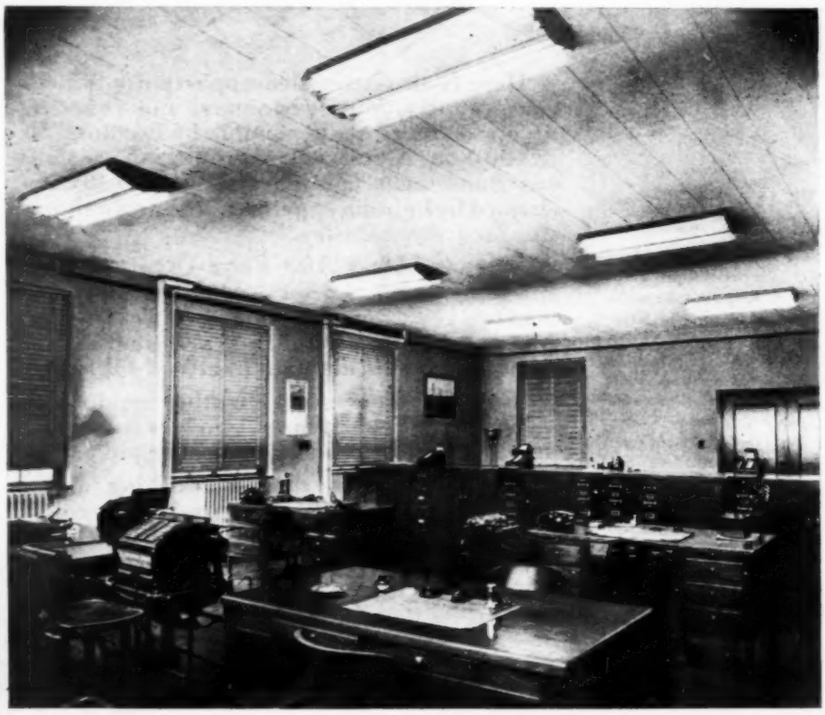
SOLUTION OF PROBLEM—Surface mounted, fluorescent luminaires are installed in 10-ft. by 12-ft. centers. The luminaires are each equipped for 4 white 40-watt fluorescent lamps, with glass strip diffusers, which cut off direct view of the lamps at normal angles.

RESULTS—The installation produces uniform illumination of 38-43 foot-candles at desk levels.



LAYOUT PLAN *showing the spacing and arrangement of the luminaires.*

FLUORESCENT UNITS *with glass strip diffusers light this utility company office.*



ment, backed by almost 100 years of commercial and industrial lighting specialization. There is an answer to your problems in this unbiased lighting service.

TO PLANTS *with National Defense* SUB-CONTRACTS

THE DARK DAYS OF FALL AND WINTER BRING NEW HAZARDS TO PRODUCTION SCHEDULES AND PRECISION STANDARDS

Light Up Now to Insure Peak Production!

WILL the coming of dark Fall and Winter Days slow down operations in your plant? Will your workers be hampered by the lack of sufficient lighting for accurate seeing and sustained productive effort? Not if you act now to have Benjamin revamp your lighting system to conform to the higher standards demanded by the urgency of Defense Production.

How Better Lighting Improves Operating Efficiency

Modernizing your lighting system with Benjamin plans and equipment makes your plant independent of fluctuations in daylight; keeps production up to standard even on dark, cloudy days; and insures that all workers in all departments have uniform light at all times of day and night. Modern Benjamin Lighting also insures better utilization of floor space by permitting the most efficient arrangement of machines, benches and assembly lines as they are made independent of daylighting facilities.

Make Sure Your Plant Lighting Meets Both Requirements

The basis of Better Lighting as provided by Benjamin Equipment is MORE LIGHT. Experience demonstrates that employees engaged in Defense Production need from 35 to 75 footcandles to see faster, easier, with greater accuracy and less fatigue . . . to get the job done quicker, better and with less waste of manpower and materials.

Better Lighting also involves providing light of CORRECT QUALITY . . . the light must be evenly distributed over the working surface; must be soft and diffused to minimize *reflected* glare; and the lamps must be adequately shielded to protect the eyes from fatiguing *direct* glare.

To provide such Better Lighting, most economically and efficiently there is a complete range of Benjamin Lighting Equipment comprising many special types of fluorescent, incandescent, mercury vapor, explosion proof and vapor tight fixtures. All are built "like a battleship" with an *extra safety factor* of strength to meet the durability required of industrial lighting equipment for continuous operation and sustained lighting efficiency.

Write Today

for bulletins illustrated at right, containing data and specifications for laying out your lighting system and specifying the proper equipment. Available without cost or obligation, in the solution of your lighting problems, are the services and facilities of the Benjamin Engineering Department.

Preferred Deliveries

Benjamin's entire plant facilities are being concentrated on the production of lighting equipment for Defense needs. Those with Defense Production will have preference on deliveries consistent with priorities regulations.

Warning

Delivery schedules on materials necessary in the construction of lighting equipment are uncertain. Therefore, to insure having your lighting equipment when needed, it is advisable to place your order for lighting equipment as far in advance as possible. Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

ATTENTION . . . ELECTRICAL CONTRACTORS!

Be sure to call the attention of your industrial customers to this current Benjamin advertisement appearing in leading industrial magazines and use the information it contains in selling Better Lighting Programs.

Send for this FREE Catalog

In developing lighting plans and lighting specifications, consult the "Benjamin Catalog No. 26" or the "Manual of Factory Lighting Practice", or "Benjamin Fluorescent Lighting Bulletin No. 40". If you do not have "Catalog 26" . . . the 400 page handbook of Industrial Lighting . . . in your files, send for one now on your letterhead.

Use Benjamin Engineering Service

For special lighting problems or any other assistance, you are invited to use without cost or obligation the facilities and services of the Benjamin Engineering Department and the Benjamin field organization. Consult the Benjamin Distributor in your territory or write Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

BENJAMIN TRADE MARK

WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Use of Electric Instruments

[FROM PAGE 32]

Recording voltmeters are also used to advantage for checking variations in voltage between phases or the unbalance of voltage of polyphase a-c. systems. One danger of unbalanced voltage is that 10 to 15 per cent unbalance between phases may cause double the normal amount of current to flow in one phase of induction motors of low impedance. Where direct current is used, low voltage on shunt motors causes a loss in speed with a corresponding loss in production. With series motors, it may cause overheating and destruction of the armature.

Checking lighting circuits with recording voltmeters will help get maximum life out of lamps. The illumination from a lamp is lowered considerably for a small decrease in voltage at the lamp. When overvoltage is applied, the life of the lamp is decreased rapidly. Frequent 24-hour tests should be made on all important lighting circuits and an effort made to obtain an average voltage corresponding to the rated voltage of the lamps used.

A recording voltmeter of the strip-chart type installed in the power house, or on the incoming distribution line for every plant, will check disturbances on the system. It will also provide a record of the length of time of service interruptions, and will assure that voltage regulation is within the plant's requirements.

Recording wattmeters occupy an important place in general motor and feeder-circuit testing. The switchboard type can be applied to generators and feeder circuits and important substations. This gives a graphic picture of load conditions, peak loads, and line disturbances. A frequent check on feeder circuits should be made to determine the economic load for each circuit. This point is neglected in many industrial plants.

Recording ammeters are valuable on electric drives. This instrument record usually indicates the load. An a.c. ammeter record gives less information of the actual power load, because of the variation in the motor power-factor, and because in small motors the current does not increase greatly between one-quarter and full load. As a means of limiting the heating of a motor, however, such an a.c. ammeter may be used to indicate the maximum permissible ampere load on the motor. The recording ammeter is especially useful on motors driving centrifugal pumps where the pump characteristics periodically allow the motor to become overloaded. The operator, guided by the instrument, may regulate the discharge valve to keep the current at or below the allowable limit.

Both a.c. and d.c. recording ammeters should be applied to machinery drives that are subject to periodic overloads or peaks which may result in damage to motors or to mechanical equipment if the operator does not stay on the job. These drives, in general, include those for all stirring, mixing, kneading, or rolling machines where the density or viscosity of the process material may vary. A switchboard recording ammeter should be installed at each drive for the information of both the operator and those responsible for the operation of the plant and its maintenance.

Power-factor portable recorders are of great assistance in making power-factor surveys of large motor drives and of feeder and generator circuits. This instrument may be introduced into any circuit, and will locate the circuits which require power-factor correction. The switchboard type is often used on incoming or outgoing feeders of power substations for use in determining the power-factor of the load.

Hook-on volt ammeters are one of the handiest of all instruments for general plant testing. This has the advantage of being usable without accessory equipment over a wide range of loads and voltage. The G-E type AK-1 instrument, for instance, is a combination a.c. ammeter and voltmeter, measuring current up to 600 amperes and voltage up to 600 volts. It is particularly handy, in that there is no necessity for cutting the line or shutting down equipment while making measurements. Both current and voltage can be measured quickly and easily with a single set-up.

The hook-on instrument can be used to measure current in all types of cable conductors—even those in lead sheaths or steel conduit. It can also be hooked around fuses, oil-circuit breaker bushings, and current-carrying parts of an air circuit breaker, simplifying measurements of enclosed wiring over those made with the conventional ammeter.

These suggestions cover the more frequent uses of instruments. But it should be remembered that there are a great many types available for unusual applications. The important thing is that actual facts concerning electric circuits are necessary in order to attain maximum efficiency and freedom from trouble. Electric instruments expose the facts, and there is an instrument available for every situation.

More Gossip

Now a Contractor

John Schwarz, formerly a plant electrical engineer and formerly connected with Buhl & Caffrey, electrical contractors of Newark, N. J., has opened his own business as an electrical contractor and engineer at Rahway, N. J. He specializes in heavy industrial electrical construction.

***INSTALLMENT CREDIT** regulations affect many contractors selling refrigerators, washing machines and other electrical appliances. Wm. A. Ritt, secretary-manager of the Minnesota Electrical Council and Ed Raetz, of Rochester, Minn., president of the Minnesota Electrical Association, discuss trade-in problems with L. Tomsaeger of the Ninth Federal Reserve Bank of Minneapolis.*

New Name

Ricketts-Sewell Electric, Ltd., is the new name recently taken by the S. F. Ricketts Electric, Ltd., operating at 342 West Pender St., Vancouver, B. C. S. Ricketts, president of the firm and former secretary of the Vancouver Electrical Association, has long been connected with the electrical industry in Great Britain, the Orient and Vancouver.

From Spark to Flame

The small spark of life remaining in the Union County Electrical Contractors Association, Elizabeth, N. J., was kindled into a roaring flame of activity recently. More than 60 per cent of the contractors in the county attended an all-out call to discuss impending contractor legislation.

A State Licensing Bill for electrical contractors, now lying in the legislature, was read and discussed in open forum. A senior assemblyman from the county was present to explain the legislative angles. Although not adverse to state licensing, this group went on record as strenuously opposing the bill in its present form. The boys are now trying to do something about the situation and get a bill which will be of more benefit to all concerned.

WE'LL KEEP 'EM COMING ...via GraybaR

Nobody is up against a more important job today than America's electrical contractors and those who follow through on electrical work within the plants. Electricity is the lifeblood of modern industry, and it's up to you to see that it flows *where* it should, *when* it should, along lines that lead to greater efficiency at the point of use. It's up to you to put more power into these "Arsenals of Democracy" and to keep 'em humming.

Backing you up are another group of men with a big job on their hands . . . the manufacturers who are doing their best to turn out the equipment and supplies you need. In spite of raw material shortages and emergency demands, they're finding ways to produce products with new time-saving and production-boosting features . . . products that meet the needs of the hour, and have service-value to spare for many years to come.

Standing between you and these manufacturers . . . a part of the same "combat team" . . . you'll find your GRAYBAR Man. He's not a miracle-worker . . . he can't pull non-existent products out of a hat . . . but there's one thing you can be sure of: To the extent that *knowing your needs* will help, to the extent that *knowing what's available* will help, and to the extent that *cutting delays in distribution* will help . . . you can count on GRAYBAR to keep 'em coming!

ALONG THE RACEWAYS of NATIONAL DEFENSE

THIS is happening today in countless places: An electrician on a Defense job is all set to lug, tap and splice any and all types of conductors.

He carries a kit of these T & B Pressure (solderless) Connectors.

T & B HINJON JUNIOR

Twelve fittings tap all mains No. 8 to 1,000,000 CM to all branches No. 14 to No. 1. Solid or stranded

T & B Locktite Tap

Six fittings tap all mains 1/0 to 500,000 CM to all branches No. 2 to 500,000 CM

T & B LOCKTITE LUG

Seven fittings take all cable sizes No. 4 to 1,000,000 CM

T & B LOCKTITE 2-WAY

Seven fittings make all splices No. 4 to 1,000,000 CM

EASY DOES IT

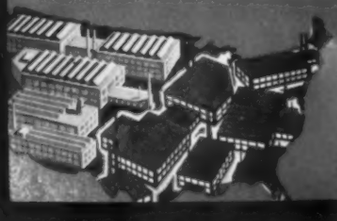
Armed only with screwdriver and socket wrench, the electrician quickly makes permanent connections with surprising ease, and the speed that National Defense demands.

Two generations of manufacturing skill are behind these modern T & B products. Approved by Underwriters. Sold only through T & B Distributors located in all important centers.

THE THOMAS AND BETTS CO., INC.

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N. J.



YOU KEEP 'EM HUMMING

Electric

ORANGEBURG HAS BEEN A LASTING NAME "UNDERGROUND" FOR 48 LONG YEARS

ORANGEBURG CONDUITS

are contributing to the uninterrupted flow of defense products—by providing complete and lasting cable protection from the central station to the transformer—and the transformer to the tools*

*In addition to the usual outdoor services, Orangeburg Materials have also been installed in the floors of many aviation plants.

ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

Photograph by Nesmith

THERE ARE EXTRA PROFITS FOR EVERY CONTRACTOR IN EVERY *"time-and-material-saving"* FOOT OF

ORANGEBURG *Conduits*

Made at Orangeburg, New York, by the Fibre Conduit Company, 292 Madison Avenue, New York, N. Y.
11-FC-2

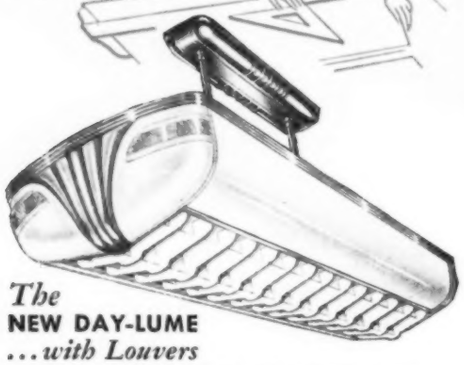
WE'LL KEEP 'EM COMING

Via GraybaR

The **EXPOSED TROFFER**

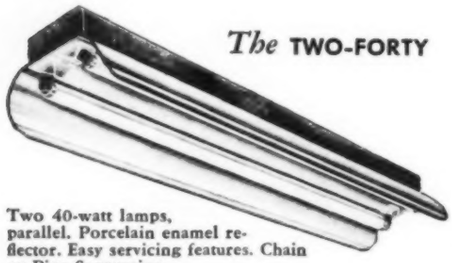
NEW . . . The Day-Brite Louvered-type Exposed Troffer brings to offices, plants, factories, a high Over-All Illumination Efficiency. . . . Sizes—One and two 48-in. 40-watt lamps parallel, and one 60-in. 100-watt lamp. For single unit installations and continuous runs.

"ABOVE ALL"
Defense Planning Needs
ADEQUATE LIGHTING



The
NEW DAY-LUME
. . . with Louvers

Combining all the developed and accepted advances in fluorescent at its best. Glow-tone molded plastic ends—louver shielding of normal line of vision assures well diffused, shadowless direct light . . . SIZES: Suspension Type for four 40-watt lamps, and two and three 100-watt lamps . . . Ceiling Type for four 48-in. 40-watt lamps.



The **TWO-FORTY**

Two 40-watt lamps, parallel. Porcelain enamel reflector. Easy servicing features. Chain or Pipe Suspension.

Day-Brite "Keeps 'Em Humming" Delivers Fluorescent at Its Best

Every hour counts in the drafting room and offices which make up "the brain" of National Defense. Lighting conditions must be ideal morning, noon and night. That's the important job checked up to fluorescent in the present emergency.

Day-Brite engineering will help you capitalize completely on the advantages of fluorescent. Analysis of specific needs, recommendations based on many pioneering years of experience and detailed blueprint layouts combine to achieve a lighting efficiency which rivals daylight.

DayBrite Rivals Daylight

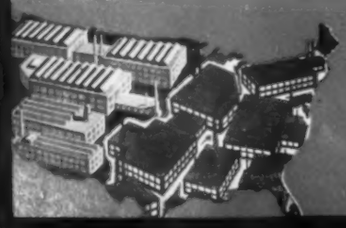
"EASY INSTALLATION" FEATURES
Make Light Quickly Available

Every Day-Brite fixture is designed so that installation can be completed in minimum time and at minimum labor cost. This means that Day-Brite fixtures can be "put to work" without unnecessary delays and that hours thus saved are available for the speed America needs.

Day Brite Fluorescent

Trade-Mark Registered

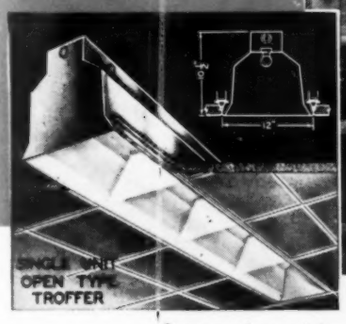
DAY-BRITE LIGHTING, INC., 5443 BULWER AVE., ST. LOUIS, MO.



YOU KEEP 'EM HUMMING

Electrical

ILLINOIS TOOL CO., CHICAGO

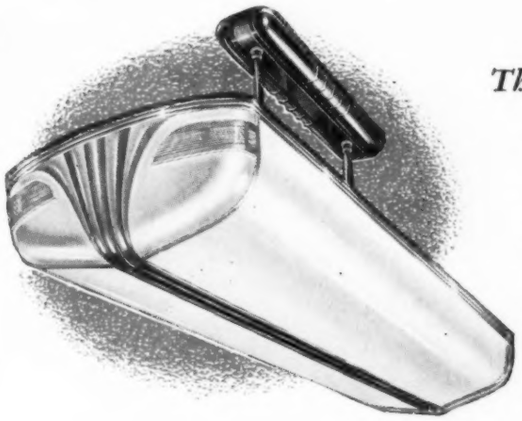


Cross section and installation view of Day-Brite continuous single row open-type Troffer.

Day-Brite Recessed Troffers . . . Another installation where the advantage of a "blanket of illumination" is fully evident . . . Troffer sides are flared at an angle radial to the lamp to form the "blending section" . . . This provides a smooth light transition from the fixture to the ceiling, eliminating visible glare from the normal angle of vision.

The **KINGSWAY**

Direct Ceiling Mounting . . . Furnished in Units, 2, 4, 6 and 8 ft. long—also continuous for 2 and 3 rows of lamps. Get Bulletin F-48.



The **DAY-LUME**

A glare-free source of illumination, with smooth plastic side panels and molded plastic ends. Suspension Type, four and eight 40-watt lamps; two and three 100-watt. Direct Ceiling Type, four and eight 40-watt lamps. Send for Bulletin F-49.

The **PARALUME**

A very popular Day-Brite Unit for general lighting —furnished for 2, 3 or 4 lights. Direct ceiling or suspension mounting. Send for Bulletin F-50.

The **SUPER TWO-HUNDRED**

Two 100-watt lamps, parallel. Porcelain enamel reflector. Chain or Pipe Suspension.

The **THREE-FORTY**

Three 40-watt lamps, parallel. Porcelain enamel reflector. Chain or Pipe Suspension.

Manufacturers of the Complete Line of Fluorescent Lighting Fixtures

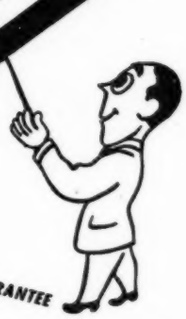
28

Adds Hours for Defense

WE'LL KEEP 'EM COMING

Via GraybaR

ILG

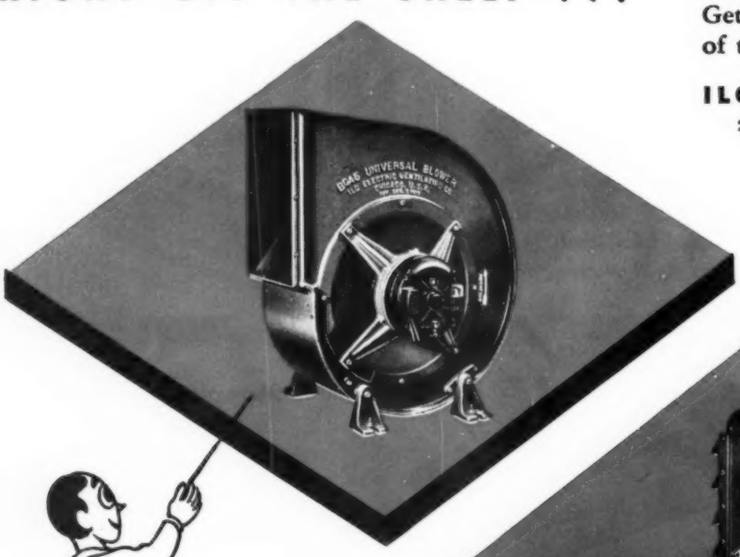


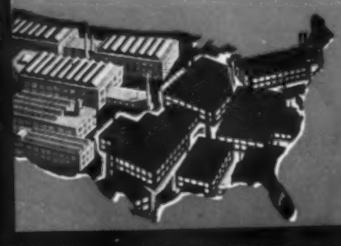
3-SHIFT QUALITY

"RIGHT OFF THE SHELF"...

WANT fast action on a heating or ventilating problem? Call in Graybar — in most cases you can get ILG "3-shift quality" apparatus *right off the shelf!* This "he-man" equipment, identified by its famous green diamond trademark, has been the choice of far-sighted management for over 35 years. Today it takes 3-shift, 24-hour-a-day continuous operation right in its stride . . . stands ready to serve long years after the present emergency is over. Get the facts — use inquiry form on last page of this section or phone nearest office today.

ILG ELECTRIC VENTILATING CO.
2879 N. CRAWFORD AVE., CHICAGO, ILL.
OFFICES IN 43 PRINCIPAL CITIES



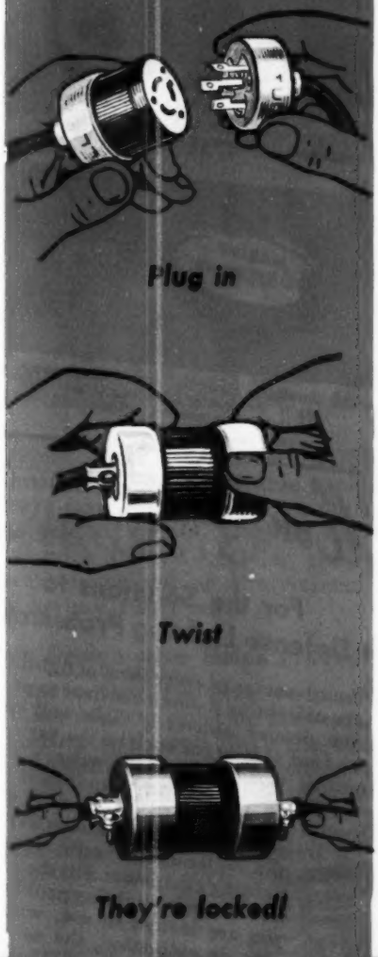


YOU KEEP 'EM HUMMING *Electrically*

HUBBELL *Twist Lock* DEVICES

Provide Positive LOCKED ELECTRICAL CONNECTIONS

NEVER DISCONNECT ACCIDENTALLY



★★★ ELECTRICAL CONTRACTORS serving NATIONAL DEFENSE INDUSTRIES know that the NATION'S NEEDS are of FIRST IMPORTANCE.

HUBBELL *Twist-Lock* WIRING DEVICES are doing their part in speeding up defense efforts by providing LOCKED ELECTRICAL CONNECTIONS for PORTABLE TOOLS AND APPARATUS.★★★

HARVEY HUBBELL, INC.

BRIDGEPORT, CONNECTICUT

UNLIMITED POSSIBILITIES AND APPLICATIONS IN INDUSTRY

Twist Lock Devices Stay Put Permanently

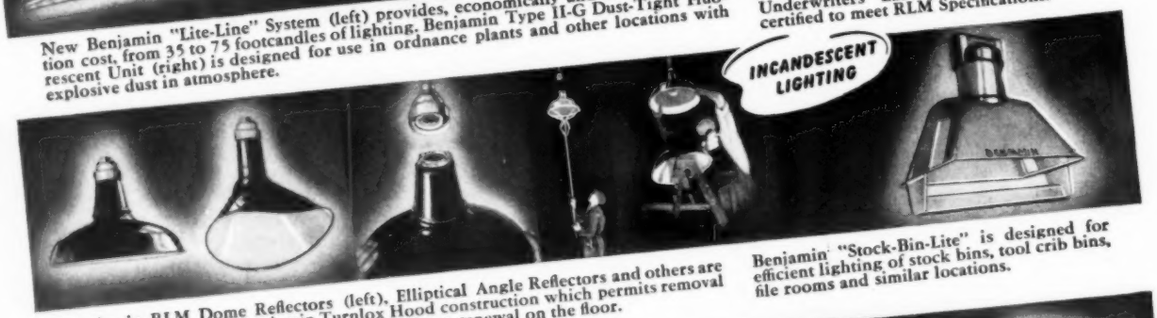
WE'LL KEEP 'EM COMING

Via GraybaR

Headquarters for DEFENSE LIGHTING

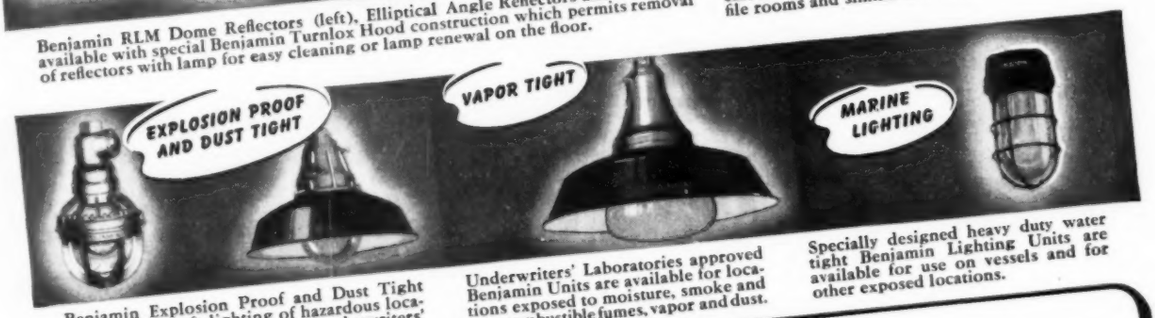
New Benjamin "Lite-Line" System (left) provides, economically and at low installation cost, from 35 to 75 footcandles of lighting. Benjamin Type H-G Dust-Tight Fluorescent Unit (right) is designed for use in ordnance plants and other locations with explosive dust in atmosphere.

Backed by Benjamin Warranty of Performance and Construction; approved by Underwriters' Laboratories; most types certified to meet RLM Specifications.



Benjamin RLM Dome Reflectors (left). Elliptical Angle Reflectors and others are available with special Benjamin Turnlox Hood construction which permits removal of reflectors with lamp for easy cleaning or lamp renewal on the floor.

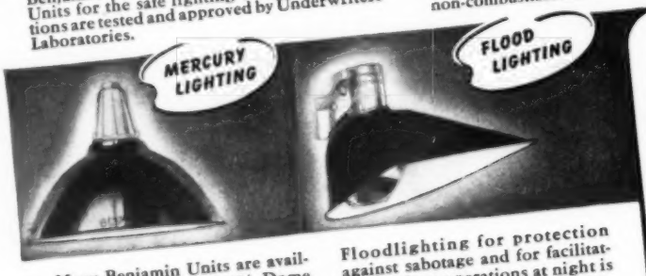
Benjamin "Stock-Bin-Lite" is designed for efficient lighting of stock bins, tool crib bins, file rooms and similar locations.



Benjamin Explosion Proof and Dust Tight Units for the safe lighting of hazardous locations are tested and approved by Underwriters' Laboratories.

Underwriters' Laboratories approved Benjamin Units are available for locations exposed to moisture, smoke and non-combustible fumes, vapor and dust.

Specially designed heavy duty water tight Benjamin Lighting Units are available for use on vessels and for other exposed locations.



Many Benjamin Units are available including the 20' Dome Type illustrated here which is designed especially for the most economical lighting of mills, erecting shops and other high bay locations.

Floodlighting for protection against sabotage and for facilitating outdoor operations at night is vital to National Defense Production. Benjamin Floodlighting Equipment is the result of years of engineering study and experience.

Call on Graybar

For the Solutions to Your Defense Lighting Problems

Take advantage of every form of lighting and type of lighting fixture necessary to provide the proper *amount of light* and the proper *kind of light* for each of the various operations and locations in your plant. Specify Benjamin Lighting Equipment as illustrated and described in Benjamin Catalog No. 26 and in various Benjamin Bulletins on specific types of lighting equipment. For the solution of special lighting problems, you are invited to use, without cost or obligation, the services of your nearest Graybar Lighting Specialist.

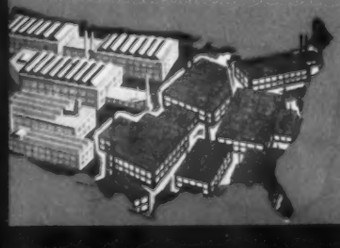
Benjamin Electric Manufacturing Co.
Dept. H, Des Plaines, Illinois

BENJAMIN

TRADE MARK

WORLD LEADER IN INDUSTRIAL LIGHTING EQUIPMENT

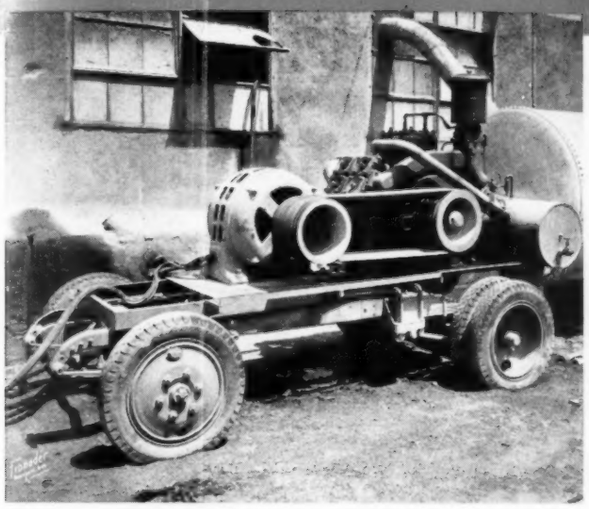
DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS



YOU KEEP 'EM HUMMING

Electricalls

If You Have Trouble With Starting Loads Causing Fuses to Blow—



"a dragging starting load . . . often blew fuses"

read what Electrician Gregory has to say . . .

"We use three portable compressors, powered by 3 phase 60 cycle 440 volt motors. These compressors stand outdoors all the time. On cold mornings after they have not been used all night the oil in them is very stiff. This causes a dragging starting load and the resulting delay in getting the motor up to speed often blew fuses—which interfered badly with getting work under way.

"About 1936 we installed BUSS Super-Lag fuses. We find they hold where other fuses failed. They proved a practical cure for shutdown troubles."

O. S. Gregory, Electrician,
Dewey Portland Cement Co.,
Davenport, Iowa

Why BUSS fuses can help you, too, prevent many needless interruptions of work

In the case cited by Electrician Gregory it is the time-lag built into the BUSS Fuse-Link that permitted compressors to start under the same conditions that had formerly caused ordinary fuses to blow.

The "lag-plates" attached to the BUSS Fuse-Link are responsible for this desirable time-lag. Unusually heavy starting currents or other harmless overloads seldom cause BUSS Super-Lag fuses to open—yet with all this time-lag they will operate under heavy overload or short-circuit conditions as safely as any fuses made.

Fuse-Case Design Also Helps Prevent Shutdowns

It takes more than time-lag to prevent needless blows. Poor contact must be prevented, otherwise excess heating will soon raise the temperature of the link and cause it to blow needlessly. Then the circuit is out and the user is penalized by a useless shutdown.

The BUSS Fuse-Case is designed to insure good contact on the link, even when renewed by an inexperienced person—and is so designed that vibration or heavy overloads or constant heating or cooling of the fuse will not permit poor contact to develop.

Given good contact in the clips BUSS fuses will always carry their rated load and will not open needlessly no matter how long they are in service.

Act on the Facts

If you are interested in preventing many "false-alarm" blows that are entirely unnecessary—

If you want to keep things humming and save needless waste of maintenance time—

If you believe that a protective device should protect against senseless interruptions of electrical service as well as against electrical hazards—

You will find it to your advantage to act at once and standardize on BUSS Super-Lag Renewable Fuses.

Bussmann Mfg. Co., University at Jefferson, St. Louis
Division McGraw Electric Company

BUSS FUSES

super-lag

WE'LL KEEP 'EM COMING

Via GraybaR

PEAK PRODUCTION CALLS FOR *Continuity* AS WELL AS SPEED!

The WESTON (Model 430) Maintenance Tester

Built for active maintenance . . . extremely compact, rugged, and with *enduring* precision. Extra large openings with hand calibrated mirror scales insure quick, accurate readings. Available in AC and DC instruments and single phase wattmeters. Inexpensively priced.

The WESTON (Model 703) Foot-Candle Meter

Measures fluorescent, mercury-vapor, incandescent and all other types of lighting *direct* . . . without correction factors. Equipped with the WESTON VISCOR filter . . . a stable, all-glass filter which corrects for all types of lighting regardless of color composition. Saves time, eliminates errors in testing. Available in models for shop and laboratory requirements.

Here are the tools industry is using to help keep motors and machines constantly in fighting trim; forestalling costly breakdowns and work interruptions, eliminating power losses . . . *and*, because of their simplicity, broad utility and dependable accuracy, cut precious hours from the usual testing routine. Weston Electrical Instrument Corporation, 672 Frelinghuysen Ave., Newark, New Jersey.

The WESTON (Model 633) AC Clamp-Ammeter

Provides the quickest, simplest means for testing electrified equipment regularly . . . thus insuring efficient, uninterrupted operations. The clamping jaws are simply closed over the conductor or bus-bar, and current reading taken. Circuits are never disturbed . . work never interrupted. Has 6 AC current ranges for maintenance needs.

The WESTON (Model 785) Industrial Circuit Tester

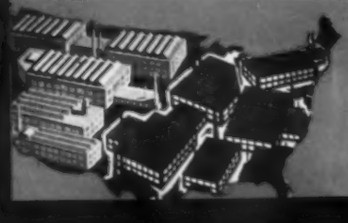
With 27 carefully selected voltage, current and resistance ranges, Model 785 handles "trouble" in the most efficient, practical manner. With DC voltage sensitivity of 20,000 ohms per volt, it is ideal for testing sensitive relay circuits, signal and telegraphic systems, photocell circuits, alarm systems, etc. . . . also for testing small motors and controls, lighting circuits, etc. Can also be used with current transformers and voltage multipliers.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

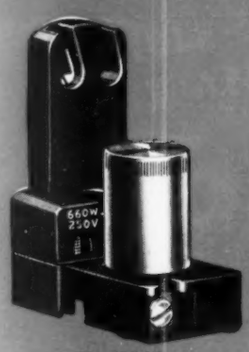
FOR OVER 53 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS



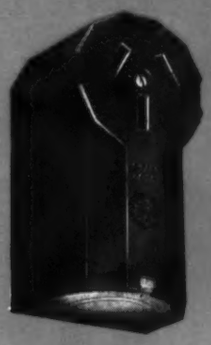
YOU KEEP 'EM HUMMING

Electrical

The Bryant Line is on the March!

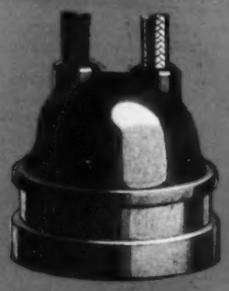


No. 4308
Fluorescent Lampholder with Starter

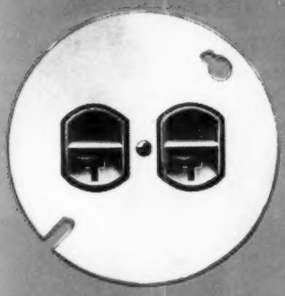


No. 3826
Range and Industrial Connector

No. 3103
Cord Grip Connector



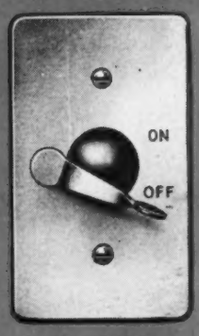
No. H310
Weatherproof Lampholder



No. 4702
Box Mounting Outlet

No. 3921
Surface Tumbler Switch

No. 5861
Shallow 20-Ampere Switch



No. 4431
Weatherproof Switch

ADEQUATE WIRING SERVES AND SAVES

Every effort is being made to increase production of Bryant Wiring Devices—to keep them coming off the line to do their part in the great defense effort.

And now, more than ever, we think it is vital to build into every wiring device the typical Bryant quality which assures dependable performance and long service. And that's what we *are building* into every Bryant device.

The country-wide network of Graybar facilities is at your command, ready to help you keep America's emergency program on the march.

Write for the latest Bryant Catalog (No. 40): The Bryant Electric Company, Bridgeport, Conn.

BRYANT

SUPERIOR WIRING DEVICES

Every outlet deserves a Bryant device

WE'LL KEEP 'EM COMING

Via GraybaR

Sell FLUORESCENT by Wakefield! and boost your sales!

The GRENADIER

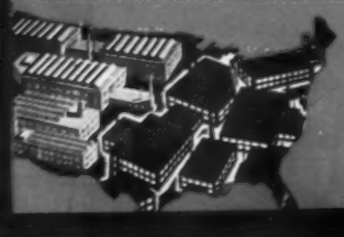
See how Wakefield GRENADIERS modernized this office. Used in continuous lines as suspended troffers, these popular two-lamp units tripled light on desks and file drawers to help speed seeing and reduce eyestrain. It's comfortable light, too, since GRENADIERS put some light on the ceiling, are adequately louvered to prevent glare. Maintenance cost is low. Lamp replacement is easy. And especially important to you the GRENADIER is a certified Fleur-O-Lier. That means greater satisfaction for customers and . . . *fewer service troubles for you.*

The BEACON

With "paper work" in almost every sales office doubled and tripled, see how the BEACON provides easier seeing to speed it along. This practical four-lamp unit is a big help to sales office or store. Low in cost, it provides well-diffused light with high efficiency. In stores, it's effective for lighting both counter and wall shelving area. Maintenance cost is low. New improved construction makes relamping easier. And it's a certified Fleur-O-Lier. Meets over 50 vital specifications for good light, balanced performance, trouble-free operation . . . which makes it easier to sell.

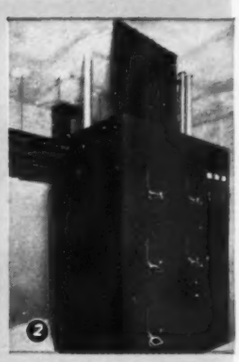
The F. W. WAKEFIELD BRASS CO.
111 Contract Park, Vermilion, Ohio

Ask your GRAYBAR house for details on Certified Fleur-O-Liers by Wakefield

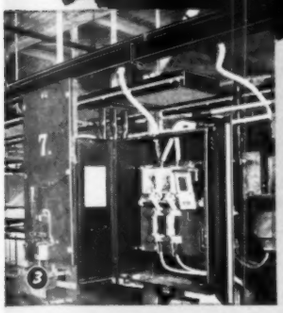


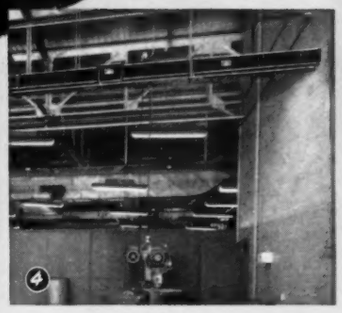
YOU KEEP 'EM HUMMING Electrically

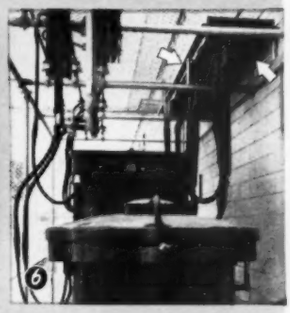
THIS NEW PLANT "Has Everything" FOR FLEXIBLE "PLUG-IN" LIGHT AND POWER



[1] From this outside Transformer Bank No. 1 (3-500 KVA, 3 phase, 220 volts), a short run of Bull Dog 4000 amp. "LO-X" BUStribution DUCT connects transformers through wall to Bull Dog Switchboard No. 1, [2] from which four runs of Bull Dog BUStribution DUCT feed into the plant. One of 1000 amp. "Plug-in" type feeds air compressors and boiler room, one of 1500 amp. "Plug-in" type leads through Maintenance Department and Tool Room to Switchboard No. 2, and

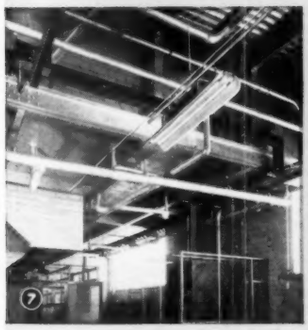






[3] two runs of "LO-X," one of 2000 amp. and one of 1500 amp. feed hydrogen brazing furnaces, as shown above. In the foreground is a run of Bull Dog Kbl-Duct enclosing wires and cables for the furnace control panels directly below. [4] This 325 foot run of Bull Dog 1500 amp. "Plug-in" type BUStribution DUCT which ties in Switchboards 1 and 2, also serves as a power plug-in source for the Maintenance Department and Tool Room.

[5] From this long run of 1500 amp. "Plug-in" type BUStribution DUCT, a run of 750 amp. branches off to the left, the tap-off being made through a Bull Dog 3 Pole 800 amp. Circuit Breaker Cubicle Adaptor. [6] This Transformer Bank No. 2 (3-200 KVA) feeds Bull Dog Switchboard No. 2, by means of a 1500 amp. "LO-X" BUStribution DUCT through wall at back of Switchboard, which is tied into Switchboard No. 1 by the



[7] run of 1500 amp. "Plug-in" type Bus Duct coming into switchboard from the left. Outgoing run at top of switchboard is Bull Dog 500 amp. "Plug-in" type, while tapping-off from this run in the upper foreground is a run of Bull Dog "125" Bus Duct. [8] Here is a run of 500 amp. Bull Dog "Plug-in" Bus Duct with runs of "125" "Plug-in" Duct, connected by means of Bull Dog Vacu-Break Bus Plugs in the 500 amp. Duct, and Bull Dog End Cable Tap Boxes in the "125" Duct.

[9] Close-up of one of the 147 ft. runs of Bull Dog "125" Duct, and of several parallel runs of Bull Dog Universal Trol-E-Duct, which feed and support the 200 watt fluorescent lights throughout the entire plant. [10] One of twelve Bull Dog Narrow Column Circuit Master Panels which feed and control runs of Bull Dog Universal Trol-E-Duct, connections being made by conduit and Bull Dog FC-2108 Outlet Box.

THESE PHOTOS of this great new defense plant show how Bull Dog Bus Duct systems provide flexible lighting throughout the plant, and flexible power, with various protective "plugs" for each individual machine. Write for Bulletins 403 and 412 describing these modern wiring systems, or better yet, ask for a call from a Bull Dog sales engineer.

BULL DOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
Bull Dog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS OF Vacu-Break Safety Switches, Circuit Master and SafToFuse Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

WE'LL KEEP 'EM COMING

Via GraybaR

Two Good Rules for C

RULE No. 1—ALWAYS USE

"INCH-MARKED"

PAT. APPLIED FOR

ELECTRUNITE Steeltubes

REG. U. S. PAT. OFF.

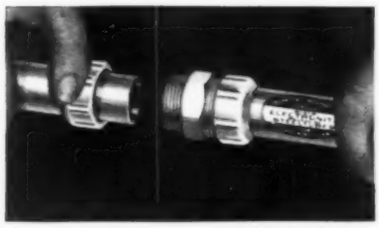
RULE No. 2 —is a good rule, too—a foot-rule clearly printed on every length of "Inch-Marked" ELECTRUNITE STEELTUBES. From end to end, every inch and foot is clearly marked for you.

You can forget your pocket foot-rule for most of your work. You can save the trouble of opening it up and putting it away every time you want to measure off for a bend or cut length. You won't have to juggle a foot-rule on a piece of tube while making a pencil mark. The mark for cutting or bending already is made for you—and made accurately.

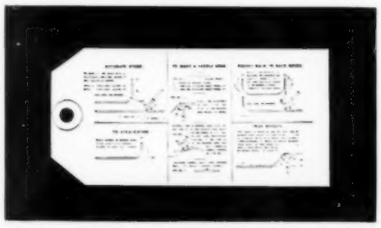
Your work will be easier—with less chance for error and wasted material lost through off-size bends and short lengths.

"Inch-Marked" ELECTRUNITE STEELTUBES will bring you other toil-saving advantages. You'll have no threads to cut—no long lines to turn. Two simple compression-type fittings make tight joints a simple matter. Light weight saves aching arms and backs. The ELECTRUNITE Bender simplifies bending by hand and the bending instruction tag tells you how. The patented knurled inside finish makes wire pulling as much as 30% easier.

"Inch-Marked" ELECTRUNITE STEELTUBES is fully approved for exposed, concealed or concrete slab construction. Any U. S. Government agency can use this material by requiring that it conform to the *emergency alternate* — E-WW-T-806a — for Federal Specification WW-T-806 which is similar to the 1940 National Electrical Code. Try it on your next job. See why it is called the "easiest-to-use rigid steel raceway in the world." Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.

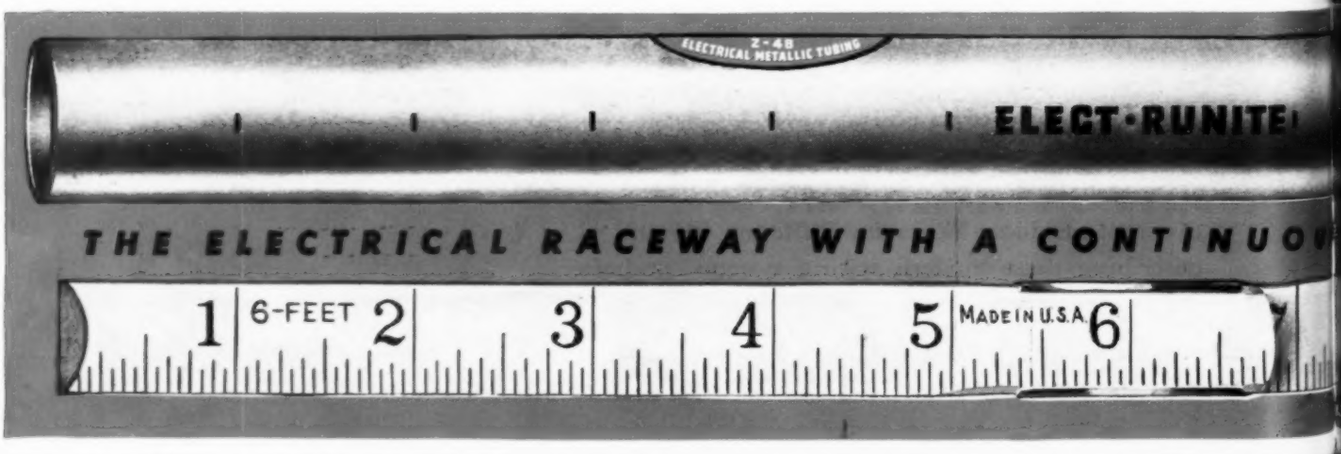


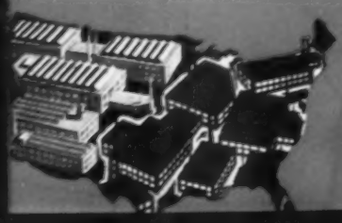
You don't have to "steam-fit" ELECTRUNITE STEELTUBES. Two simple compression-type fittings end tiresome, dirty thread cutting.



The new bending tag, supplied with each shipment of tubing, provides simple instructions and diagrams for making various bends.

With this new ELECTRUNITE Bender you can make any standard bend more accurately and with less effort than ever before possible.





YOU KEEP 'EM HUMMING

Electrical

Contractors and Maintenance Men

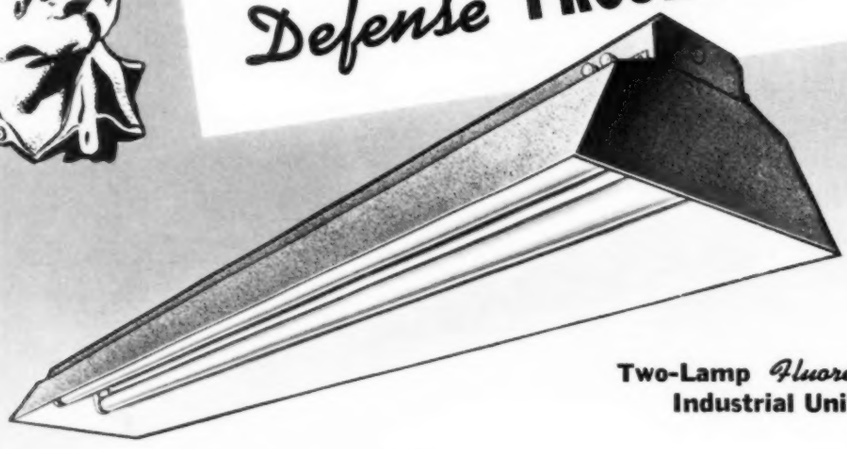
YOUR ELECTRUNITE DISTRIBUTOR WOULD RATHER SAY "YES"

Your ELECTRUNITE Distributor wants to help you in every way possible. That's why he carries a complete line of dependable electrical supplies. But, because of the present emergency and the demands of National Defense for the materials he handles, he may have to say "NO" to some of your requests when he'd rather say "YES." See him first. Tell him what you need and where you want to use it. He'll do everything in his power to help you keep schedules moving.

WE'LL KEEP 'EM COMING

Via Graybar

"Old Timers" Say
LET CURTIS EQUIPMENT SPEED YOUR CUSTOMERS *Defense* PROJECT . . . . .



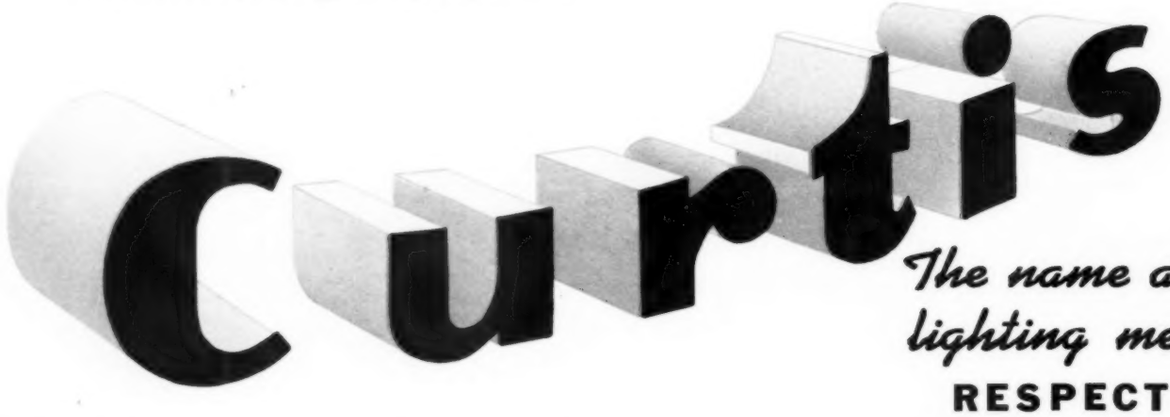
Two-Lamp *Fluorescent*
Industrial Unit

Even EXPERIENCE DEMANDS GOOD LIGHTING

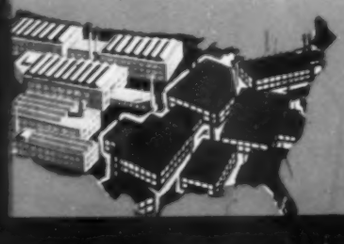
Those defense projects that your customers are working on can be turned out faster and better under good lighting. The two-lamp industrial unit illustrated above has been designed specifically to provide good lighting under modern production conditions. Two sizes are available for 2-40 watt or 2-100 watt fluorescent lamps. Both sizes have well designed reflectors with the efficient, tough Fluracite reflecting surface. Write for Serial 1045 for full information.

While you're making the lighting layout for the plant, take a look at the office and remember that draftsmen and clerks will need good lighting too. Curtis has a *complete* line of lighting equipment.

CURTIS LIGHTING, INC.
6135 W. 65th St. Chicago, Ill.



The name all lighting men
RESPECT



YOU KEEP 'EM HUMMING

Electrically

FIRST THINGS FIRST

with each and all of us

IN business and our private lives alike, the Nation's need comes first, to-day. You, as contractors, know how, on defense work—plant enlargements, shop remodeling, essential housing—the way is open for securing the materials essential to the job. The precedence in which your orders are filled is, however, regulated by priorities—and, in turn, our purchases of practically all raw materials are furnished on preference classifications. In times like these each of us must keep "first things first" as our part in the gigantic industrial contribution this country must make to preserve all Democracy stands for.

GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

WE'LL KEEP 'EM COMING

Via Graybar

TIME-PROVEN PRODUCTS

Reliable Fuse Protection Aids Defense Program

Prevents Damage to Motors and Electrical Equipment —Prevents Serious Shutdowns

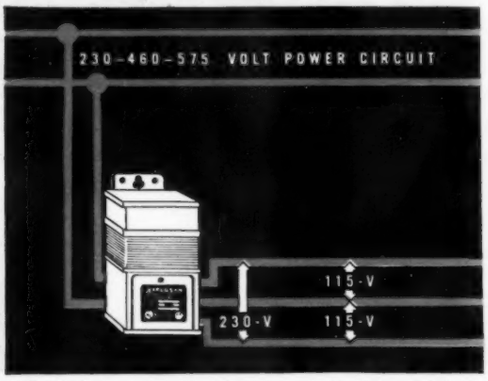
● Keeping electrical horsepower on the job is vital in our production program and Jefferson Renewable Fuses provide the safe, reliable protection needed . . . they prevent needless interruptions and guard against damage to equipment.

When excessive overloads require these fuses to open the circuit, they do it safely and reliably. Their rugged construction and simple design permit quick and proper cleaning, and renewal of the links.

JEFFERSON UNION
RENEWABLE FUSES

A Way to Cut Power Costs...*and Reduce Installation Time*

You help to conserve important metals, too, since less copper and conduit are required.



● Reducing power costs is accomplished by distributing only the higher-voltage lower rate power current, and providing the 115 to 230 volt circuits where desired for lighting and appliances by means of Jefferson Electric Power Circuit Transformers . . . Less copper and conduit are required, installation time is reduced, load centers can be located to prevent line drop, and more stable voltage conditions maintained . . . Bulletin 401-PCT contains complete data.

JEFFERSON
Power Circuit
TRANSFORMERS
AIR-COOLED

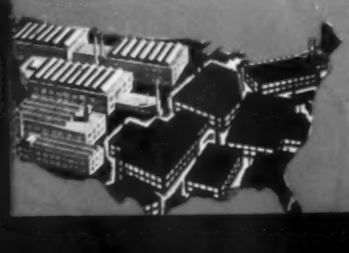
For the Best FLUORESCENT LIGHTING BALLASTS *Are As Important As the Lamps*

Industrial fluorescent lamps by The Edwin F. Guth Company, St. Louis, Mo., in windowless foil mill—equipped with Jefferson Electric Ballasts.

● With the rapidly increasing use of fluorescent lighting it has become apparent that for best results, the Ballasts are as important as the lamps . . . Lamp manufacturers and the engineers and contractors know the important role played by the Ballasts. The correctness of design, the thoroughness of construction electrically and mechanically, make Jefferson Electric Ballasts first choice by a wide margin . . . You protect yourself by specifying Jefferson Ballasts, always.

JEFFERSON
Fluorescent Lamp
BALLASTS

JEFFERSON ELECTRIC COMPANY, *Bellwood* (Suburb of Chicago) *Illinois*



YOU KEEP 'EM HUMMING *Electrically*

QUICK RELIEF FOR "GROWING PAINS" IN DEFENSE PLANTS

- 250-600 V AC
- 125-1000 Amp.

JUST "HANG UP" FLEX-A-POWER AND PLUG IN YOUR MACHINES !

INSTALLATION, relocation or extension of electric power distribution to meet changing needs can be just that simple . . . with FLEX-A-POWER, since Trumbull pioneered this startling development in 1927 we have continually improved its efficiency and utility.

Flex-A-Power is, in effect, a modern panelboard "running the length of the plant", and it comes to you all ready to hang up and connect. Machines "plug in" at any desired point along the line with FLEX-A-PLUGS that are self-contained switching and protective devices. Relocation or addition of machine units is a matter of minutes, and the whole system is SALVABLE when future changes become necessary.

Available in sizes and capacities for both large and small load requirements.

Do no more plant wiring till you have full information on this newer, better way. Ask for Circular 328.

ESTABLISHED 1899

THE TRUMBULL ELEC. MFG. CO. — PLAINVILLE CONN. U.S.A.

A GENERAL ELECTRIC ORGANIZATION

KEEP *Alert* ELECTRICALLY use your TRUMBULLAIDS

NEW YORK - PHILA. - BOSTON - CHICAGO - DETROIT - NORWOOD, (CINN.) O. - ATLANTA - NASHVILLE - LOS ANGELES - SAN FRANCISCO - SEATTLE

TRUMBULL

WE'LL KEEP 'EM COMING

Via GraybaR

1881 | 1891 | 1901 | 1911 | 1921 | 1931 | 1941

For 60 Years
We Have Served American Industry . . .

Today's WHEELER RLM FLUORESCENT UNITS

KEEP PRODUCTION ROLLING for NATIONAL DEFENSE NEEDS

In thousands of plants engaged in Defense work, Wheeler Fluorescent Lighting Units are helping to "keep production rolling" by providing *correct* levels of illumination for many different working operations.

There is a type of Wheeler Fluorescent Unit available for practically every industrial lighting requirement.

WHEELER
COMPLIANCE WITH RLM STANDARDS INSTITUTE CERTIFICATION PROGRAM IS VERIFIED BY PERIODIC TESTS CONDUCTED BY ELECTRICAL TESTING LABORATORIES.

STANDARD UNITS

RLM 48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM 48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit

RLM 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM 60" Fluorescent Two-Lamp Closed-End Poreclain Enamel Diffuser Unit

RLM 48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM 48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit

RLM 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit

48" CLOSED END UNITS

Available in two- or three-lamp constructions. Can be mounted individually or in Continuous Rows. For use with two or three 48-inch, 40-watt Fluorescent lamps.

60" CLOSED END UNITS

Two units available: (1) Diffuser Unit, having apertures in reflector which permit approximately 2½% of the light to pass into the upper zone. (2) Standard Unit (without apertures). For use with two 60-inch, 100-watt Fluorescent lamps.

48" OPEN END UNITS

Made in two- or three-lamp constructions. Units can be mounted from chain, conduit or directly to the ceiling. For use with two or three 48-inch, 40-watt Fluorescent lamps.

60" OPEN END UNITS

Available in two styles: (1) Diffuser type (with apertures). (2) Standard type (without apertures). For individual mounting only. For use with two 60-inch, 100-watt Fluorescent lamps.

ALL WHEELER RLM Fluorescent Units conform to vital construction and performance requirements established by the RLM Standards Institute. The RLM Label is your guarantee of trouble-free operation.

In addition to the complete line of RLM Units available, Wheeler manufactures many styles of units in one, two or three lamp constructions and in 15-, 20-, 30-, 40- and 100-watt sizes.

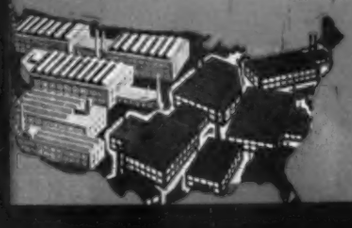
For complete information, write for copy of new Wheeler Fluorescent Bulletin.

Distributed Exclusively Through Electrical Wholesalers

1881 — 60th Anniversary — 1941

WHEELER REFLECTOR COMPANY

BOSTON · MASS.



YOU KEEP 'EM HUMMING

Electrically

It bends!

Sherardizing uses zinc dust, a by-product, and conserves zinc.
The most effective, uniform zinc method is Sherardizing.

NATIONAL NE 6 WIRES AND CABLES

National Electric Products Corp., Pittsburgh, Pa.

WE'LL KEEP 'EM COMING

Via Graybar

TAKE IT FROM ME–

Mitchell is the Electrical Contractor's FLUORESCENT Line!

THE RIGHT CONTRACTOR POLICY

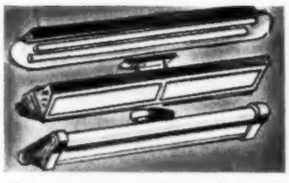
Yes—we're sold on you—the Electrical Contractor. We believe in you as the logical channel for the sale, installation and service of Fluorescent Lighting. That's why we've made MITCHELL the logical Contractor's Fluorescent Line—with a powerful policy that gives you the protection, profits and cooperation your service and skill deserve. Just look at the plain facts of the MITCHELL policy:

THE RIGHT CONTRACTOR LINE

MITCHELL is the line that's styled-right, engineered-right, built-right—so that you can sell it with absolute confidence! It's Better Fluorescent Lighting and you can sell it easier because you can prove its superior quality by actual demonstration—right before your customer's eyes. Just check this proof—and you will see why MITCHELL is the *"Electrical Contractor's Line"!*

MITCHELL Fluorescent Units are nationally-known for quality, and are sold only through a select group of franchised wholesalers who are contractor-minded — who are cooperative, helpful—willing to work with you.

The MITCHELL line has the clean kind of distribution you want. You will never run into competition from fixture "peddlers", "poachers", or mail order. You are protected on every bid you make.



Just name your fixture for any job—and you will find MITCHELL has it! It's The Complete Line for the Contractor, covering every Industrial, Commercial, and Home Lighting application.

Only MITCHELL has the Triple-Label — *Fleur-o-lier Certification, *Underwriters' Approval, *MITCHELL's Own guarantee—the powerful 3-Way guarantee of quality that helps you sell.

You are entitled to adequate profit margins, because in the last analysis, yours is the work and the responsibility. MITCHELL prices assure you attractive, protected profits to make your efforts worthwhile.

MITCHELL gives you all the concise, correct information and data you need. A flood of punchy sales aids together with practical technical data help you sell easier, help you service easier, helps you profit more.

MITCHELL units are easier to install, easier to maintain. Starting is positive, quick; operation is trouble-free. No need for "extra service" that cuts into your profits. You sell lighting results that satisfy!

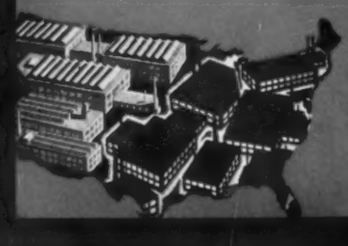
Selling MITCHELL Better Lighting is a sure way to get hearty customer handshakes and repeat business. Yes, you build yourself a real future in Fluorescent with MITCHELL — the Electrical Contractor's Line.

MR. CONTRACTOR: *SELL LIGHTING RESULTS*—SELL *MITCHELL!*

MITCHELL MANUFACTURING CO.

2525 N. Clybourn Ave., Chicago, Ill.

"A GREAT NAME IN LIGHTING"



YOU KEEP 'EM HUMMING *Electrically*

-for Home Defense ★

Buckeye steel conduit simplifies installation of extra telephones that guard welfare of the home

To make for better installation of that extra telephone which the owner of the new home is sure to want, remember to put in conduit while the house is being built.

Insulation, firestops, stud bracing or other building materials usually block up spaces in walls and under floors, making it impossible to conceal telephone wires after the house is finished. A few lengths of conduit and outlet boxes, properly located by the foresighted builder, will be worth many times their modest cost, in permitting quick installation of the extra telephone in the kitchen, den, upstairs hall, or bedroom.

26-21D

Conduit - Sheets - Plates - Bars - Tin Plate - Rods - Wire - Nails - Pipe and Tubular Products - Tie Plates and Spikes

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steels
General Offices - YOUNGSTOWN, OHIO

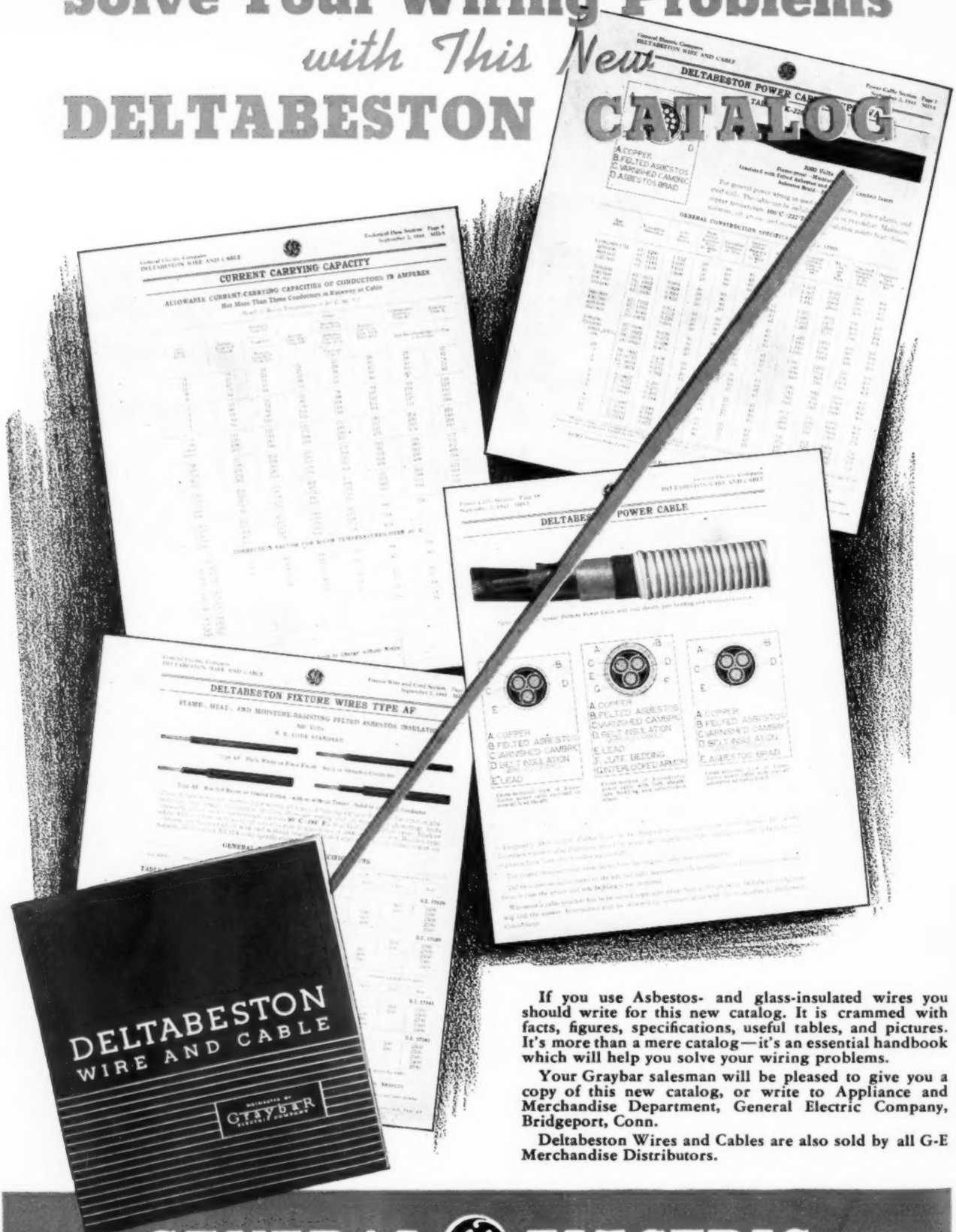
WE'LL KEEP 'EM COMING

Via GraybaR

Solve Your Wiring Problems

with This New

DELTABESTON CATALOG

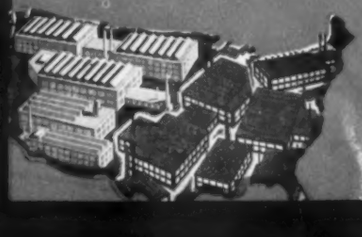


If you use Asbestos- and glass-insulated wires you should write for this new catalog. It is crammed with facts, figures, specifications, useful tables, and pictures. It's more than a mere catalog—it's an essential handbook which will help you solve your wiring problems.

Your Graybar salesman will be pleased to give you a copy of this new catalog, or write to Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

Deltabeston Wires and Cables are also sold by all G-E Merchandise Distributors.

GENERAL ELECTRIC



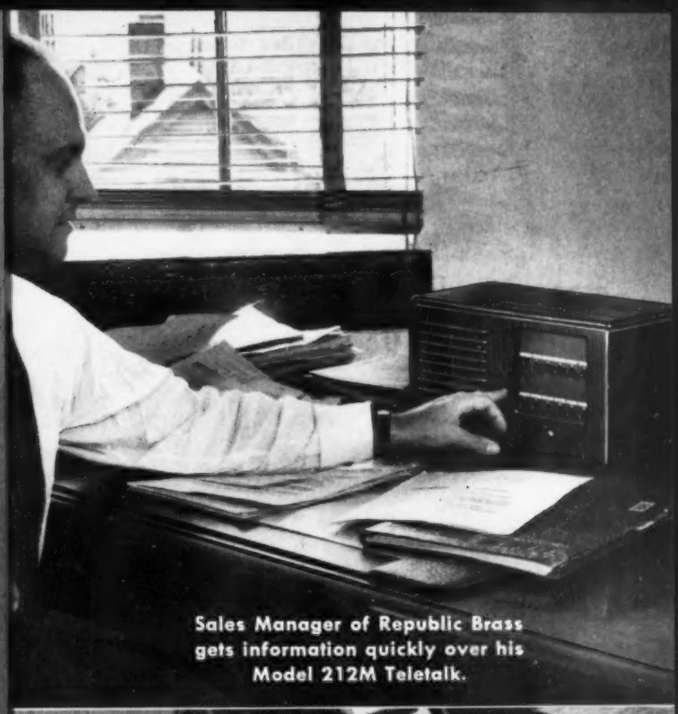
YOU KEEP 'EM HUMMING

Electrically

YOU CAN KEEP ORDERS COMING

...if you push

WEBSTER ELECTRIC
Teletalk
REG. U.S. PAT. OFFICE



Sales Manager of Republic Brass gets information quickly over his Model 212M Teletalk.

Dealers who have come to recognize that three-way profit in the sale of Teletalk are enthusiastic about it.

Invariably, once they have sold one system, sales of other systems follow consistently.

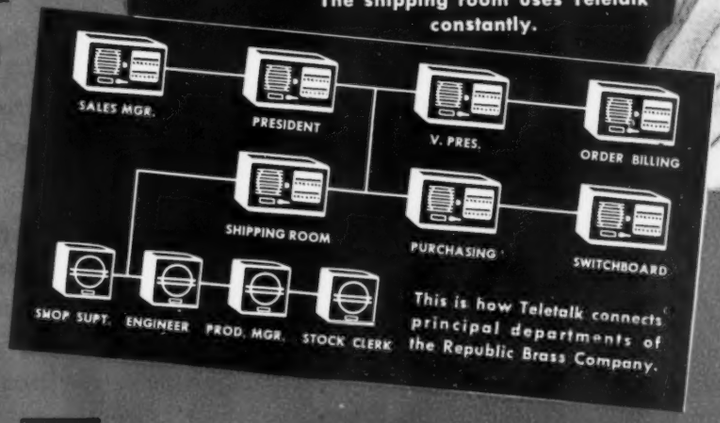
For instance, take the system illustrated on this page. It was sold by a progressive dealer to the Republic Brass Company, Cleveland, Ohio. It was sold, not by high pressure methods, but on the basis of competitive demonstrations. This dealer surveyed the requirements of the Republic Brass Company, and Teletalk was selected "because of its superior performance over other systems." Republic Brass liked its appearance, its natural-voice tone. They were quick to appreciate the speed of inter-office communication which it provided and the saving in steps, time and energy which resulted.

This order meant a nice profit for the dealer. It meant the sale of seven Model 212 Teletalks, four Model 5A-45 Teletalk speaker microphones, three hundred feet of 12-pair cable, and five hundred feet of 1-pair cable, with necessary clamps and fittings. In addition to this, there was a substantial profit involved in the labor of installation.

Teletalk is not difficult to sell. Business institutions of every size need it and appreciate it once it is demonstrated to them. Prospects know about Teletalk because of Teletalk advertising. You only need to survey a prospect's requirements to initiate an order. Your distributor's salesman will show you how.

Today, because of increase in defense activities, Teletalk is a hot item. Go after the business now. If you want to know more about it, write for complete information or call in your local Graybar man.

The shipping room uses Teletalk constantly.



This is how Teletalk connects principal departments of the Republic Brass Company.

Licensed by Electrical Research Products, Inc., under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated

WEBSTER ELECTRIC COMPANY, Racine, Wis., U.S.A. Est. 1909. Exp. Dept.: 100 Varick St., N.Y.C. Cable Address: "ARLAB", New York City

WEBSTER ELECTRIC

"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS • IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS

WE'LL KEEP 'EM COMING

Via GraybaR

POWER CABLES MUST NOT BE "Slackers"

Feeder cables carrying power to all our important defense industries must not be slackers. They must carry their full load steadily under ordinary conditions and more when emergencies arise.

Simplex-ANHYDREX AA - LL rubber insulation was designed for just such service conditions. In it are combined the remarkable resistance to water absorption of ANHYDREX AA - 60 deproteinized rubber insulation, with the aging characteristics of the best long life insulations. With it conductors can be operated at temperatures which would be unreasonable with ordinary insulation. With it you can safely carry more power and carry it longer.

May we send you a copy of our Data Sheet No. 112 on Simplex-ANHYDREX AA - LL deproteinized rubber insulation? It contains information that should be of interest to every user of wires and cables. A post card or letter will bring it to you promptly.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

SIMPLEX WIRES CABLES

YOU KEEP 'EM HUMMING

SQUARE D
SAFETY SWITCHES
. . Everywhere

SQUARE D pioneered in the development of the Safety Switch. Today it is difficult to walk far in any direction without seeing the familiar ◫ emblem on safety switches and other electrical equipment.

In normal times or in times of emergency, Square D electrical equipment is on the job in 4 out of 5 of the country's industrial plants. It is constantly protecting production against costly interruptions.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

WE'LL KEEP 'EM COMING

Via GraybaR

... and in the Future

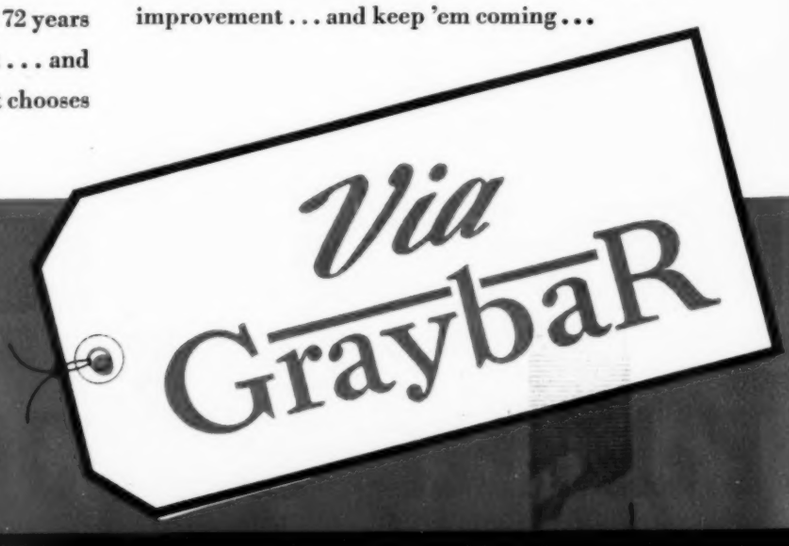
YOU CAN COUNT ON THESE FIRMS TO KEEP *BETTER PRODUCTS* COMING

BENJAMIN ELECTRIC MANUFACTURING COMPANY
THE BRYANT ELECTRIC COMPANY
BULL DOG ELECTRIC PRODUCTS CO.
BUSSMANN MFG. CO.
CURTIS LIGHTING, INC.
DAYBRITE LIGHTING, INC.
THE FIBRE CONDUIT COMPANY
GENERAL CABLE CORPORATION
GENERAL ELECTRIC COMPANY
HARVEY HUBBELL, INC.
ILG ELECTRIC VENTILATING COMPANY
JEFERSON ELECTRIC COMPANY
MITCHELL MANUFACTURING CO.
NATIONAL ELECTRIC PRODUCTS CORPORATION
SIMPLEX WIRE & CABLE CO.
SQUARE D COMPANY
STEEL & TUBES, INC.
THE THOMAS & BETTS CO., INC.
TRUMBULL ELECTRIC MANUFACTURING CO.
THE F. W. WAKEFIELD BRASS CO.
WEBSTER ELECTRIC CO.
WESTON ELECTRICAL INSTRUMENT CORP.
WHEELER REFLECTOR COMPANY
YOUNGSTOWN SHEET & TUBE CO.

Even though your present production demands may give you no chance for an eagle-eyed check on product improvements, you get an extra assurance of sound construction and up-to-the-minute design . . . now and in the future . . . when you buy from these manufacturers *via* GRAYBAR.

Here's the reason: GRAYBAR, you know, has 72 years of successful electrical distribution behind it . . . and it takes a long-term view of the future when it chooses its supply lines. It's only natural, therefore, that it generally "hooks up" with manufacturers who also have the habit of looking ahead. These are the manufacturers who continue to think about better products even when business is good. Nine times out of ten, they are the firms that lead the way in product improvement . . . and keep 'em coming . . .

GraybaR
in over 80
principal cities
Executive Offices . . . Graybar Building, New York



WIRING Methods

ELEVATED TRANSFORMER MAT

The transformers serving the new Montgomery Ward & Company retail store in Cumberland, Md., are mounted on an outdoor mat. Because of lack of space, the mat could not be located at ground level; so it was built overhead, on the rear wall of the building.

The mat is constructed of a reenforced concrete slab, supported by three I-beams fastened to the building steel and projecting beyond the brick wall. A projecting I-beam, with a steel eye, mounted to the structural steel above

***OVERHEAD MAT** on building wall solved space problem for locating the service transformers at this Cumberland retail store.*

the center of the mat serves as a hoist support for raising or lowering the transformers.

The primary, 4000-volt, conductors are fed from a nearby pole and are strung between dead-end insulators mounted above the transformers to angle iron arms fastened to the building wall and supported by angle braces. Mounted to vertical braces from one of these bracket arms is a weatherproof cabinet containing instrument transformers for primary metering. Primary disconnects are on the nearby utility pole.

The secondary conductors for the three phase, 4-wire, 120/208 volt system are racked on spool brackets mounted to the building wall directly behind the transformers. Three feeders, each of 500 MCM conductors terminate at the main switchboard in the basement of the building. They were so designed to accommodate increased future load and to assure against shutdown in case of failure of one of the feeders.

Although three 50-kva. single phase transformers are used at present, all wiring has sufficient capacity to accommodate 100-kva. transformers in the future. Sterling Electric Co., electrical contractors of Cumberland did the wiring in the store.

REPAIR TRUCK

An exceptionally trim and efficient arrangement of tools and materials on a pick-up body serves routine repairs and small construction jobs at the Circle L Electric Co. in Tulsa, Oklahoma.

A welded frame of 1-in. pipe provides a rack for conduit and ladders which may extend over the cab roof. A material cabinet is installed along one

***PIPE FRAME** and material cabinet converts pick-up body to one-stop repair truck.*

side as shown in the accompanying photograph.

The cabinet, made of $\frac{7}{8}$ wood, is divided into eight compartments of various sizes for switches, fuses, fittings, boxes, etc. It is 6-ft. long, 18-in. high and 10-in. deep, set back over the truck body so that the front lines up with the side of the cab.

***PLANK EXTENSION** forms rigid vise support at correct height clearing the truck body.*

A fixed vise stand holds a standard pipe vise on a heavy plank. When the back gate is dropped the vise may be drawn out to clear the body. The vise is permanently bolted to a 2 by 8 plank $4\frac{1}{2}$-feet long which is inserted, with a tight fit, between two 2 by 12's. The 2 by 12's are mounted on a $1\frac{1}{4}$ by $\frac{1}{4}$ iron support securely anchored to the body. The supports raise the vise to a comfortable working level.

A weatherproof box with a hasp and lock located behind the cab holds wire and cable.

WHITE MICE FOR FISHING

In a certain contract wiring job, two $\frac{3}{4}$-inch conduit lines were laid underground to make telephone connections between a main house and the maid's apartment above the garage. Each line was 117 feet long and contained two manufactured elbows, one turning into the garage and the other turning up to the apartment.

Now, the longest $\frac{1}{4}$-inch fish tape that could be purchased in the vicinity at the time was five feet short of the desired length. But this did not bother Harlan E. Buller, Jr., the electrical contractor, and his helper Bill Frank. They bought the 112-ft. lengths of fish tape and fed them into the conduits from the garage end. Then, from the cellar of the house, they inserted 5-ft. pieces of fish tape into the conduit and hooked them to the long lengths already in the conduits.

Very definite instructions were left for the Telephone Company men to pull the tape from the cellar end and feed-in at the garage. But, for some unknown

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

ARMORED CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • VARNISHED CAMBRIC

CRESCENT

a name that stands for

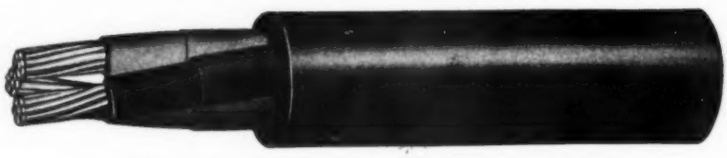
HIGHEST QUALITY

in every type of

Electrical Wires and Cables

SERVICE ENTRANCE CABLE

LEAD ENCASED POWER CABLE



IMPERIAL PORTABLE CORDS & CABLE

IMPERIAL WELDING CABLE

PARKWAY AND TRENCH CABLE

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER - AGING INSULATION

[FROM PAGE 77]

reason, the instructions were ignored and the tapes were pulled out leaving the conduits empty. For two and one half days, the Telephone men tried fishing with bailing wire. Then they tried to blow a string through the conduits with an air compressor. When this failed, they were stumped.

In the meantime, the irate contractor again got in touch with the electricians and guaranteed them ten dollars to get the tape back into the pipes. Without losing much time, the two men headed for the nearest pet shop and purchased a white mouse for 35 cents and a 10 cent ball of twine. Armed with these "tools" they proceeded to the job site.

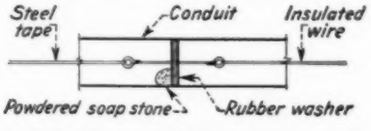
They tied the twine to the unsuspecting animal's tail and dropped him into the conduits. Unaccustomed to exploring long dark tunnels, the mouse hesitated at first. But, after a few jerks on the twine, he started off and the men were soon busily feeding in the twine.

Within an hour, the mouse completed the two trips, the twine was in the conduits and in 15 minutes the electricians were back in the shop—with a new wrinkle up their sleeves. And the Telephone Company boys are still wondering how it was done.

CONDUIT DUSTING DEVICE

A handy device for dusting conduits with soapstone and removing stones, dirt, water and other substances, has been designed and constructed by the Wheeling Electric Co., electrical contractors of Vincennes, Indiana.

This simple device consists of four



SECTIONAL VIEW showing the construction and operating principle of the conduit dusting and swabbing device developed by the Wheeling Electric Co.

rubber washers of a size that fit snugly in the conduit to be dusted or swabbed. The washers are mounted together, face-on-face, with a ¼-inch double eye bolt through the center. One eye is for hooking on the fish tape; the other for fastening the conductors to be pulled into the conduit.

When used for dusting, a quantity of soapstone is placed in the conduit before the washer is inserted. As the

Speed the Job

. . . with these Easy-Working Tapes

PANTHER
DRAGON

1
First to be Wrapped and Sealed in Cellophane

2
Perfect Adhesiveness and Tensile Strength

3
Strong Distinctive Green Core

4
Colorful Attractive Boxes

5
Made by a Company in the Insulation Business Since 1878

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE COMPANY
Wilkes-Barre, Pa.
Offices in Principal Cities

Sold Exclusively Through Distributing Wholesalers

FOUR POINT ECONOMY—

Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general-purpose transformer.

1 LOW INITIAL INVESTMENT

2 EASY TO INSTALL

3 MINIMUM MAINTENANCE

4 EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

AMERICAN TRANSFORMER COMPANY

178 Emmet St. Newark, N. J.

PRODUCTS

American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

WIRING Methods

[FROM PAGE 78]

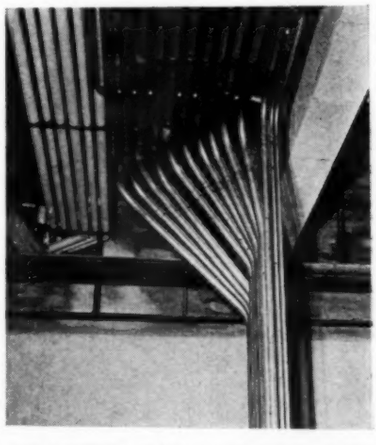
washer is pulled through the conduit it pushes the soapstone ahead of it, letting enough of it sift past to form a coating in the conduit which reduces the pulling friction of the conductors. For swabbing purposes, a snugger fit or stiffer type of washer might be necessary.

COLOR CODED LAYOUT

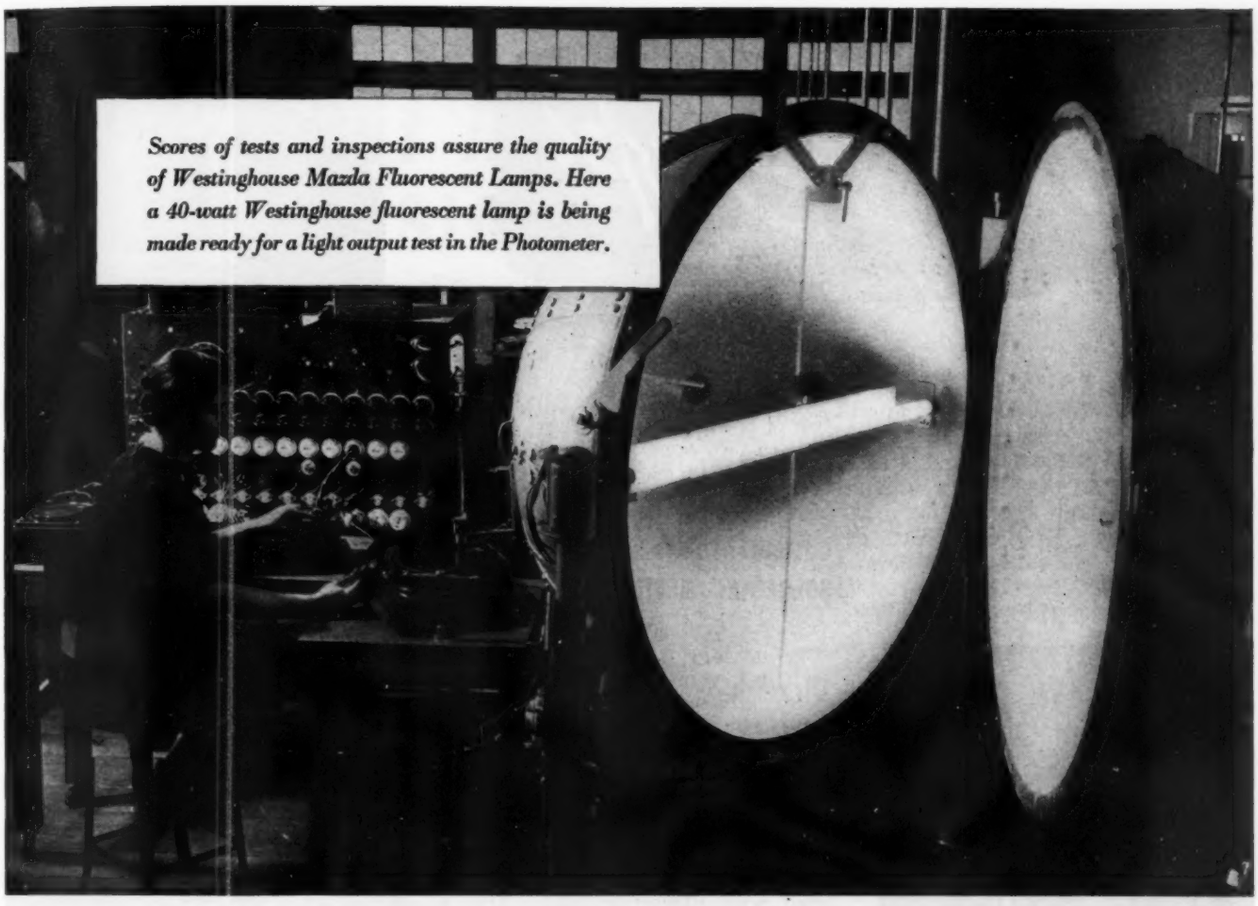
In making wiring layouts on blueprints with colored pencils or crayons, estimators at the Wetherbee Electric Co., of Oklahoma City, Okla., apply a convenient color coding system to indicate pipe size and wire size without making numerous notes on plans. Runs between outlets show the conduit size by the color of the line. Small cross marks indicating the number of wires in the conduits are likewise colored to indicate the size of wire. The code generally used is:

½-in.—red
¾-in.—blue
1-inch—green
No. 14 wire—red
No. 12 wire—yellow
No. 10 wire—aluminum.

The same color system, using colored inks, is employed in making original tracings on complex layouts.



GRACEFUL FAN of heavy conduits above a sub-distribution board in a large commercial installation is mute evidence of skilled workmanship. To transfer ten 3-inch and four smaller conduits from a vertical to a horizontal plane, the Hixon Electric Co., Boston contractors and engineers, used 90 degree sweep ells and 45 degree offsets resulting in the pipework shown above. The switchboard is directly below the vertical pipe shaft.



Scores of tests and inspections assure the quality of Westinghouse Mazda Fluorescent Lamps. Here a 40-watt Westinghouse fluorescent lamp is being made ready for a light output test in the Photometer.

It's good business to specify

WESTINGHOUSE MAZDA FLUORESCENT LAMPS

A fluorescent installation involves a good many variables. But when it comes to the lamps, contractors and users alike accept the name Westinghouse Mazda as a *constant.* It stands for quality—quality guaranteed by continuous research, sound engineering and careful manufacture.

On fluorescent lamps, the name Westinghouse Mazda makes fluorescent selling easier—because it assures to the user lamps that give more light longer.

FOR FLUORESCENT LIGHTING AT ITS BEST, SELL AND SPECIFY ⬇

Westinghouse

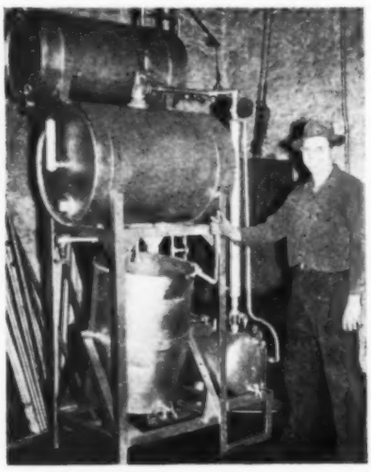
MAZDA F LAMPS

Motor Shops

OIL REFINER

Sixty to seventy per cent recovery is claimed for an oil refining rig used at the Jones Electric Machinery Co., in Topeka, Kansas. Old oil is broken down and filtered in the apparatus shown in the accompanying photograph.

The old oil is heated to a temperature of 600 degrees in the center tank. Volatiles and water are driven off and the oil distilled over, then drawn through a finolithe filter by vacuum to a trap tank. Residual ends are drawn off and the recovered oil stored in drums.



***OIL RECOVERED** with this refining system is clean and free from water.*

HEAVY REWINDS

Specializing in heavy oil field motor equipment the A. W. White Electric Machinery Co., in Oklahoma City, Okla. find precision coil machinery essential for this heavy work. An example of this work is the rewind job shown in the accompanying photo. The job is a 470 kva. alternator for 3 phase, 60 cycle, 2300 volt service. There are 210 coils, of 2 parallel number 10 square copper insulated to withstand a 25,000 volt high potential test.

Conductors are cotton covered, with two layers of cotton tape and two layers of varnished cambric. Slot insulation is fish paper with fiber slot pegs.

COMMUTATOR SOLDERING DEVICE

A gas fired soldering pot with an armature support solves the problem of soldering commutator leads on small motor armatures in the small motor department of the J & H Electric Company, Providence, R. I.

The solder container is constructed of an old fashioned soldering pot with the bottom cut off to give about a 1-inch depth to hold the molten solder. The top of the old pot is inverted and fitted with supporting legs. This is placed over the single gas burner and the lead pot placed in it. One side of the lead pot is cut away to provide clearance for rotation of the armature. The other side of the pot has a U-shaped flange bolted to the inside to provide a supporting cradle for one end of the armature shaft.

***SOLDERING SET** designed by this Providence motor shop, does a quick and thorough job of soldering coil leads to small armature commutators. It helps speed up shop production.*

The opposite end of the armature shaft is supported by a U-shaped fork welded to the threaded lifting rod of an ordinary screw type automobile jack. The jack is supported by and slides along a 12-inch length of $\frac{3}{4}$-inch square steel rod which is mounted to the base of the exhaust hood by L-shaped steel brackets. A quarter turn on the locking screw on the bottom of the jack holds it securely in place. The jack can be moved along the bar to accommodate armatures of various lengths and raised or lowered to take care of different diameters. Adjustments are made so the armature is at the proper angle to allow the edges of the lead bars of the commutator to dip into the solder about $\frac{1}{8}$-inch. The armature is rotated slowly while the commu-

***ALTERNATOR REWIND** for oil field service. Frame on side raised on blocks, offers convenient position for laying in coils and driving slot pegs.*

Put APPLETON EXPLOSION-PROOF Fittings *On Guard*

Take the double precaution, in all hazardous locations, of installing *Appleton* Explosion-Proof Fittings! Designed and manufactured strictly according to Underwriters' Laboratories standards and conforming exactly to all code requirements, they offer a *wide margin* of protection.

Heavy malleable bodies are produced in Appleton's own foundries, smoothly finished and heavily cadmium coated. *Dust-tight,* as well as explosion-proof.

As in *all types* of fittings, the Appleton Explosion-Proof line is COMPLETE! It includes safe, rugged fittings, expertly designed—mechanically and electrically—to meet *every installation requirement.*

Specify Appleton fittings for every job! They're "STANDARD FOR BETTER WIRING!"

Sold Through Wholesalers

Type "DTQEE" Dust-Tight Unilet with Lift-Cover Housing and Type "DTCP" Dead-End Plug

Type "OFC" Explosion-Proof Unilet—For Oil-Immersed or Air-Break Switches

Type "EVA" Explosion-Proof Lighting Fixture—Pendent Type with Guard and Reflector

Type "ARTE" Explosion-Proof Switch Unilet

Type "ARTC" Explosion-Proof Circuit Breaking Switch Unilet

APPLETON ELECTRIC COMPANY

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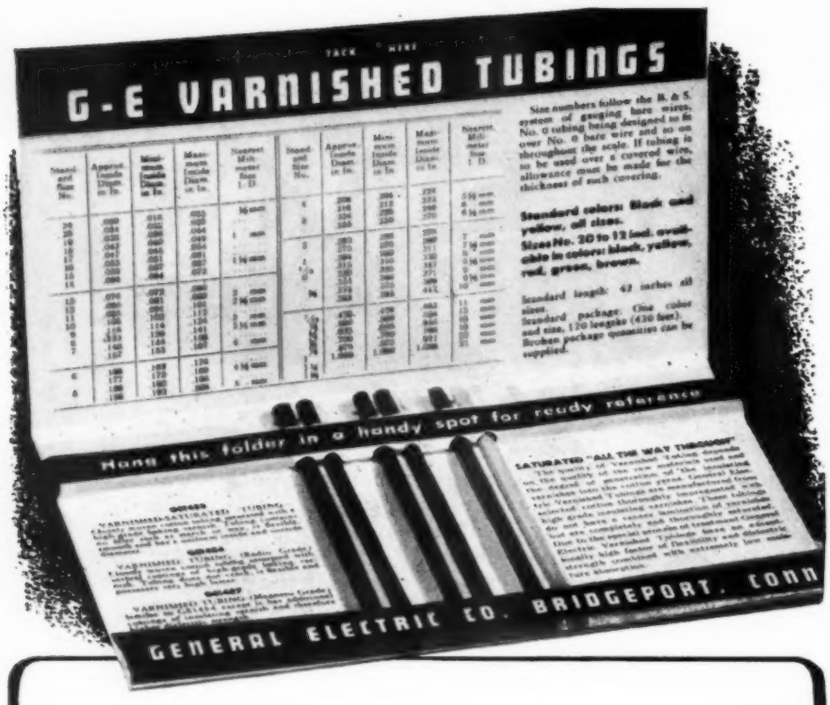
APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES



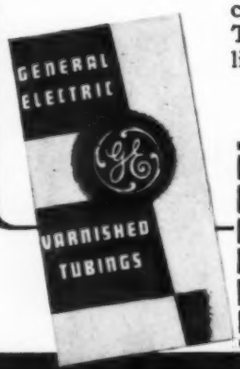
SATURATED

"All the way through"

G-E Varnished Tubings have an exceptionally high factor of flexibility and dielectric strength combined with extremely low moisture absorption. Through a special process, they are saturated with high-grade Insulating Varnishes—"all the way through."

G-E Varnished Tubings are part of the complete line of G-E Insulating Materials, a line that has proven outstanding through years of exhaustive tests with all kinds of electrical equipment. As one of the largest manufacturers of electrical equipment in the world, we recommend these materials to you. Every item does an excellent job for us. They will do the same for you.

The new sample packet illustrated above contains six colored samples of G-E Varnished Tubings with descriptions and a complete listing of available sizes.



SEND COUPON FOR SAMPLES

Section M-18A, Appliance & Merchandise Department,
General Electric Company, Bridgeport, Connecticut.

Sirs: Please send sample packet of G-E Varnished Tubings.

Name_____

Address_____

City_____ State_____

GENERAL ELECTRIC

Motor Shops

[FROM PAGE 82]

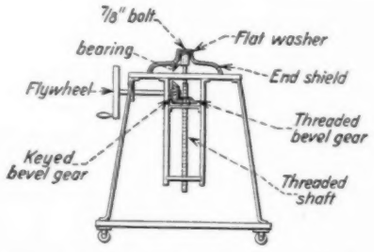
tator bars and armature leads dip into the molten solder.

The entire device is mounted in an exhausting hood to remove any fumes or gases that are given off during the soldering operation. It is quick and easy and does a thorough job, says the department foreman.

PULLING BEARINGS FROM END SHIELDS

Removing bearings from motor end shields has been simplified at the Hagerstown Equipment Co., Inc., Hagerstown, Md., by the design and construction of a bearing puller. This machine can also be used to install bearings in the end shields.

The machine, which is portable, consists of a circular steel table with four supports mounted on casters, a set of bevel gears, a long threaded shaft and



***SIMPLIFIED SKETCH** showing the operating principle of the bearing puller built and used by the motor repair department of the Hagerstown Equipment Co., Inc.*

a flywheel with a handle. Directly under a hole drilled in the center of the circular table the two bevel gears, on shafts at 90 degrees, are supported by a steel framework. The one gear is keyed to a horizontal shaft mounted directly under the table top and terminating in a small flywheel with a handle for manual operation. The other gear meshes with the first, is mounted to a supporting frame and is threaded to a long vertical shaft. This shaft is threaded on the outside surface for its entire length and is drilled and tapped at the top for a $\frac{7}{8}$-inch bolt. The lower end of this shaft has a horizontal support bar which rides up and down on a pair of vertical guide strips. A number of $\frac{7}{8}$-inch bolts of various lengths and flat washers of different diameters complete the necessary equipment.

To remove the bearing, the end

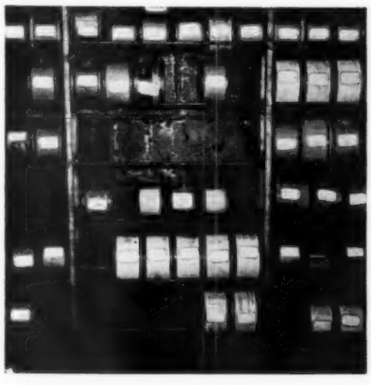
shield is placed on the table top, bell end down and with the bearing centered over the circular opening in the table. A washer of the same size as the outside diameter of the bearing is placed over the top of the bearing. A bolt of the proper length is inserted in the washer and bearing and screwed into the top of the vertical threaded shaft. Turning the flywheel in a clockwise direction causes the threaded shaft to lower and pull the bearing with it. Turning the flywheel in a counter clockwise direction causes the shaft to raise.

To install new bearings, the end shield is placed on the table top in an inverted position and the same procedure repeated. Being portable, the machine can be rolled to wherever the work may be and one man can remove or install a set of bearings in a few minutes.

SUSPENDED WIRE RACK

A simple steel rack, suspended from the ceiling beams, is used for storage of small magnet wire reels in the motor repair shop of the Central Electric Company, Bridgeport, Ohio

The rack, which is adjacent to an outer wall of the shop, is built of vertical pieces of $\frac{3}{8}$-inch by $\frac{3}{4}$-inch flat iron with parallel lengths of $\frac{3}{8}$-inch steel rod forming the cradle to hold the wire

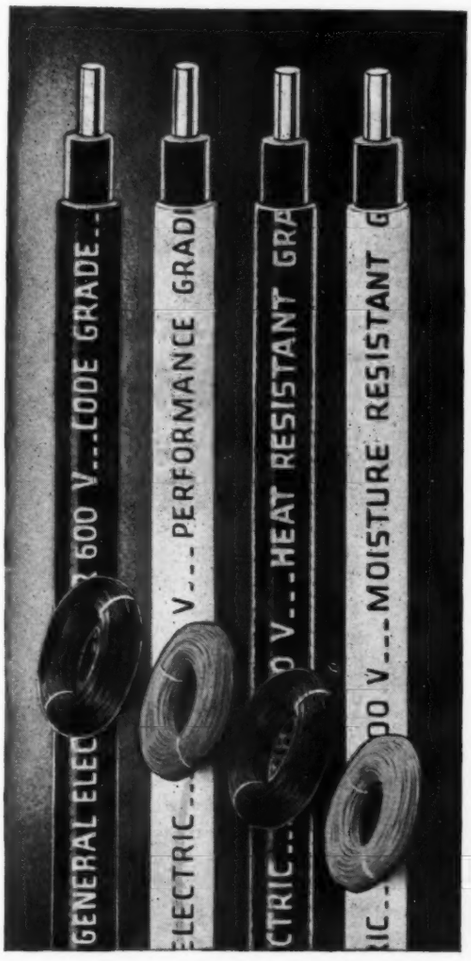


MAGNET WIRE stock of smaller sizes, is shelved on this suspended steel rack until occasion demands its use. Rack is comparatively light in weight and can be easily moved.

spools. These horizontal rods are spaced $4\frac{1}{2}$ inches apart, giving the rack sufficient depth to prevent the spools from rolling off. The vertical spacing of the rods is such as to accommodate a maximum of a 7-inch diameter spool. Welded construction is used throughout.

The total capacity of the rack, which consists of three horizontal sections, each with seven vertical tiers, is 126 spools.

FOR EASE IN INSTALLATION



Type R Type RP Type RH Type RW

USE

G-E

BUILDING WIRES

FOUR DIFFERENT GRADES AVAILABLE

You'll like G-E Building Wires because they are easy to strip, clean and pull. Different types are available for different conditions—Types R, RP, RH, and RW. You can obtain these wires right in your own territory too. G-E distributors are located at all key points in the country.

G-E Building Wires are carefully made of the finest raw materials. Their quality is uniformly high. Accurate centering of conductors in their insulation is provided by continuous vulcanization of the insulation.

Every wire has its size, type, voltage and grade of insulation printed right on the braid. Different colored braids are available.

For further information see the nearest G-E Merchandise Distributor or write to Section W-18A, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Splices In Cable Wiring

Q. *"May non-metallic sheathed cable be spliced within the walls of a building without using a splice or outlet box? In other words, may non-metallic sheathed cable be spliced the same as knob and tube wiring?"—A.R.*

A. The answer is NO. There must be a box or device enclosing the splice wherever the cable is spliced. Article 336 covers non-metallic sheathed cable. In Section 3361 is the requirement that installations of this cable shall comply with Sections 3001 to 3018, 3071, 3072 and 3362 to 3370 all inclusive.

Section 3014 includes the direct requirement that there shall be a box at each junction point of non-metallic sheathed cable but omits the requirement for a box at a junction point on knob and tube wiring unless the junction point is also an outlet or switch point.

But Section 3368 provides that the box may be omitted where switch, outlet and tap devices made of insulating material are used provided these devices have openings which fit closely around the outer covering of the cable and provided that the device will fully enclose any part of the cable from which any part of the covering has been removed.

Different Systems In Same Enclosure

Q. *"I have been informed that it is allowable to install alternating and direct current power and lighting circuits in the same conduit. I have carefully searched the National Electrical Code and Abbott's Code Handbook and fail to find a specific statement that A.C. and D.C. circuits may be used in the same conduit."*—I.C.H.

A. It is now permissible to install conductors of both A.C. and D.C. systems in the same conduit provided the restrictions of Section 3013 are met.

In the 1937 Code, Section 3013 prohibited installing conductors of A.C. and D.C. systems in the same conduit or enclosure unless barriers were provided to separate the two systems.

In the 1940 Code, Section 3013 states that "Conductors of light and power systems of 600 volts or less may occupy the same enclosure only if all conductors are insulated for the maximum voltage of any conductor within the enclosure."

This is further proven by Official Interpretation No. 194 which definitely answers this direct question by verifying that conductors carrying currents of both A.C. and D.C. systems may be installed in the same enclosure or conduit provided the limitations of Section 3013 are observed.

In Abbott's Handbook see pp. 37 and 38, Section 321.

***FORESIGHT** on inspector problems during the National Defense Emergency was evidenced during this after-session conference between J. S. Zebly, Washington; W. J. Mahan, New Haven and F. W. L. Hill, Washington. The Eastern Section I.A.E.I. meeting in Washington was the setting.*

Light and Power Wires In Same Enclosure

Q. 1. *"Is it permissible to run light and power circuits in a manually operated safety switch box? The light circuit uses the enclosure as a pull box only and there are no splices made therein. The insulation of both light and power circuits is ample for the maximum voltage."—W.J.S.*

A. Rule 3013 of the National Electrical Code now makes it possible to run light and power wires within the same enclosure, provided both systems are not over 600 volts and provided that all wires are insulated for the maximum voltage used within the enclosure.

Prior to the 1940 Code this was permissible only when both systems derived their supply from the same source of power.

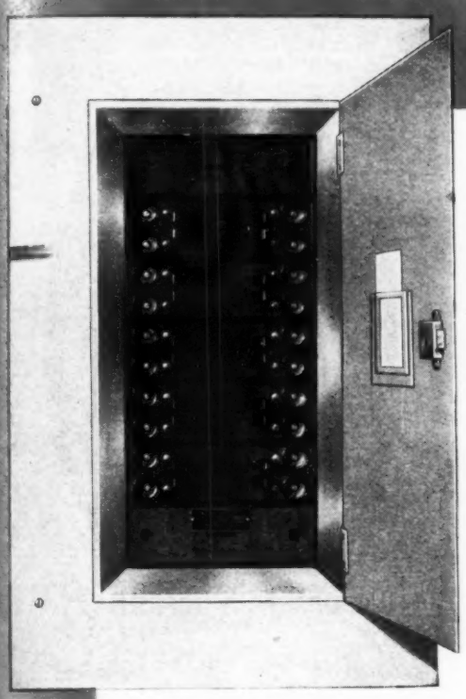
But possibly the Inspector's objection was to the amount of wire within the box. Our inquirer indicates that the light wires have no particular business in the box, but use it only as a pull box. Probably the box is too small, as many enclosed switch boxes are.

Q. 2. *"The Inspector has also ruled that the live wires must enter the switch at the top and the load lines at bottom of switch, in other words, both line and load wires may not enter at the top or bottom. This to eliminate running of wires, inside of switch enclosure from top to bottom or vice versa. As I cannot find these rulings in the Code I would appreciate your advice."—W.J.S.*

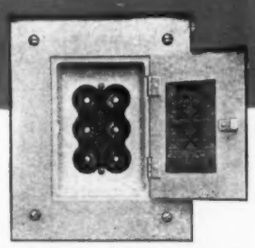
A. There is no Code rule prohibiting the running of wires around inside of a switch box. But some manufacturers turn out many switch boxes in which there is not sufficient room to do this, and Inspectors are fully warranted in objecting to over-crowding the boxes with wires.

There are also some externally operated switch boxes in which wires running around inside of the box from top to bottom are subjected to mechanical injury from the handle operating the switch.

But where the box is of sufficient size and there is no danger of mechanical injury, the Code does not prohibit wires carried around inside of the box.



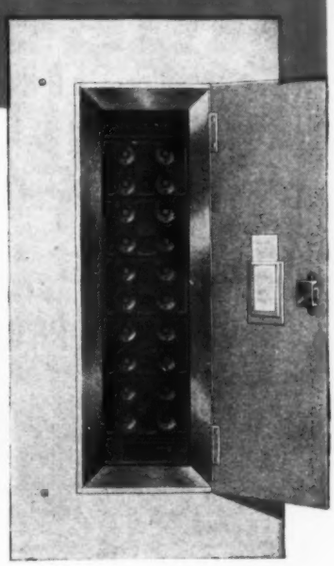
Installation in plant of The Blanton Company, makers of "Creamo" Margarin, St. Louis . . . Dennison-Loepker Electric Company, St. Louis, Electrical Contractors.



Type FBX-Enclosed Cutout. Capacity: 2 to 24 circuits. Use: Residential and small commercial installations where no switch control is required.

Type LNT1P-Panelboard. Capacity: 4 to 42 circuits. Use: Any installation where switch control of circuits at panel is preferred.

Type NR3G-Panelboard. Capacity: 4 to 32 circuits. Use: Any installation where only local control of outlets is required, and larger size gutters are needed.



There are Many Places

where one or more of the complete range of

Fuse Type Branch Circuit

FA PANELBOARDS

for LIGHTING and APPLIANCE

use, will fill the bill exactly—meeting the approval of the architect, the contractor and the owner. Safety, modern protection and attractive appearance are embodied in each panelboard.

FA Panelboards are dead front safety type, built of *standardized* molded sections, installed in *standardized* cabinets. This standardization expedites production, improves the product and lowers the cost. They are available with either fuse only, or switch and fuse branch circuits. Because of the improved type of non-tamperable fuses, with greater time-lag characteristics, which hold on momentary overload, but blow on short circuit or sustained overload, maximum protection—at moderate cost—is obtained. These safety-type panelboards, with cabinets, for flush or surface mounting, may be had with from 4 to 42 circuits. Boxes have ample knockouts in top and bottom, and ample gutter space for wiring. Adjustable supports permit an outward adjustment of ¾" for plumbing the panel, if the box is installed out of alignment. Fronts are attractively finished in pearl gray lacquer.

The simple design, yet rugged construction, 30 amp. FA Tumbler Switch used in LNT1P Panelboard.

Prompt Delivery: *There is a wholesaler near you who will make prompt delivery from stock . . . Write today for his name and address and for complete catalog information . . . . Frank Adam Electric Company, St. Louis, Missouri.*

EST. 1891 — THE SIGN OF A BETTER JOB

Frank FA Adam

1891 FIFTY YEARS SERVICE 1941

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

FOR
DEFENSE
OF
DEFENSE PROJECTS
AGAINST
LIGHTNING-

Investigate WEST DODD!

For All Types of Buildings

West Dodd, oldest and largest manufacturer of such equipment, has complete lines of concealed and semi-concealed lightning protection systems for all types of buildings. A recent installation was the new Bankers Life home office building in Des Moines, Ia. The General Electric Exhibit Building at the New York World's Fair and the Fire Safe House were also West Dodd equipped for lightning protection.

The new home office building of Bankers Life Company, Des Moines, Iowa, is West Dodd protected.

West Dodd also protected the Fire Safe House, sponsored by the Home Insurance Company at the New York Fair.

★ West Dodd lightning protection and static control equipment is being widely used on U. S. Government Ammunition Magazines, Igloos, Loading Plants, and other defense projects.

Many items of West Dodd materials have been especially designed to meet U. S. Government specifications and requirements on these projects. Conductors, points, terminals, point supports, ground plates, and other accessories approved by Underwriters' Laboratories, Inc. Passed by American Institute of Electrical Engineers.

The West Dodd engineering department will be glad to assist in planning the application, or in estimating amount of materials required and cost of applying them.

★ **SOME RECENT WEST DODD DEFENSE INSTALLATIONS** ★

Savanna Ordnance Depot, Savanna, Ill.
Elwood Ordnance Plant, Elwood, Ill.
Ravenna Ordnance Plant, Ravenna, O.
Kingsbury Ordnance Plant, Kingsbury, Ind.
Umatilla Ordnance Plant, Hermiston, Oregon.
Plum Brook Ordnance Works, Sandusky, O.
Hoosier Ordnance Plant, Charleston, Ind.
Seneca Ordnance Depot, Kendaia, N. Y.
Aberdeen Proving Ground, Baltimore, Md.
Edgewood Arsenal, Baltimore, Md.
Iowa Ordnance Plant, Burlington, Ia.

WRITE OR WIRE FOR CATALOG AND COMPLETE INFORMATION

WEST DODD
LIGHTNING CONDUCTOR CORP.
GOSHEN, INDIANA

Questions on the Code

[FROM PAGE 86]

Circuit Breakers

Q. *"Kindly give me an interpretation on a four circuit multi-breaker installation wiring for a single family residence. Is it permissible to install two circuit multi-breaker cabinets in place of the four circuit cabinet in one common enclosure?"*—B.Z.

A. Yes, this is permissible and these four circuit breakers in the two separate enclosures may be used as the service switch and protective device provided they are "in a group", that is, side by side.

OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.F.P.A.

Interpretation No. 200

Referring to the second sentence following tables of paragraph (a) of Section 3705 of the 1940 edition of the National Electrical Code.

QUESTION 1 . . . Is one conductor to be subtracted from the number given in the tables for each stud, clamp or hickey in the box?

ANSWER . . . No, one conductor is to be subtracted for any combination of clamps, fixture studs or hickeys.

QUESTION 2 . . . Are two conductors to be subtracted from the number given in the tables for a switch or receptacle, these in addition to the conductors subtracted for clamps?

ANSWER . . . No, the subtraction of two conductors for a switch or receptacle includes the allowance for clamps.

QUESTION 3 . . . In the case of combination devices, are two conductors to be subtracted from the number given in the tables for each unit (switch, receptacle, etc.) of the combination?

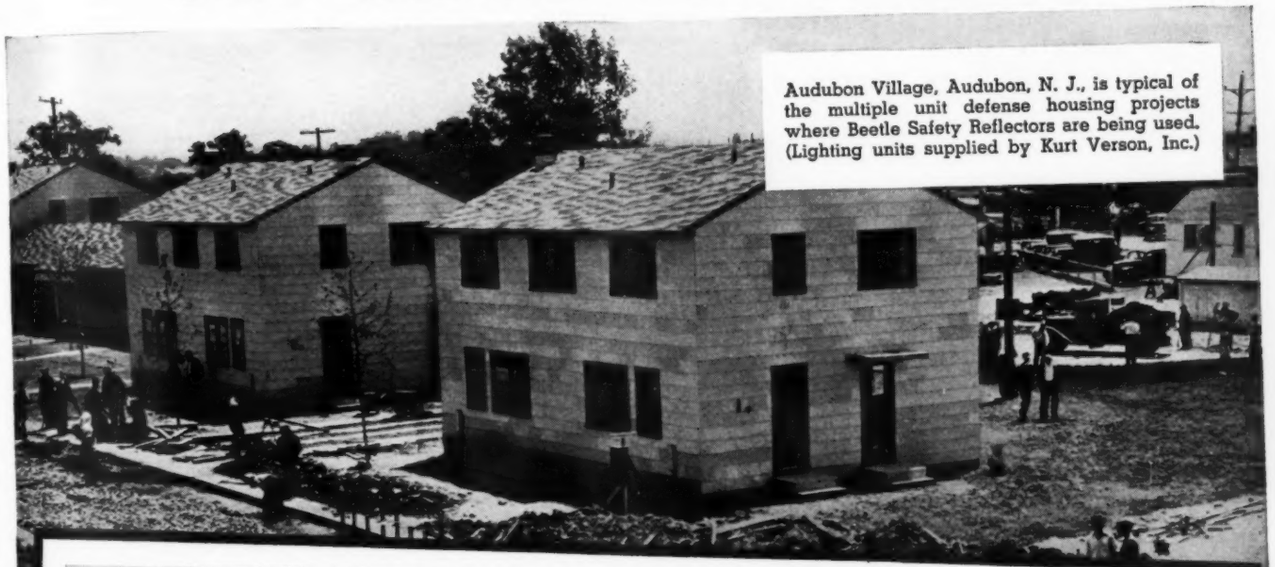
QUESTION . . . No, two conductors are to be subtracted for any such combination (switches, receptacles, etc.) that are to be used in the box.

Interpretation No. 201

QUESTION . . . Does Section 3035, which recognizes the use of Type RW conductors in wet locations, contemplate its use in parts of Class I Hazardous Locations that are judged to expose the conductors to the solvent effects of gasoline or similar liquids?

For Defense Housing

USE BEETLE FOR LIGHTING



Audubon Village, Audubon, N. J., is typical of the multiple unit defense housing projects where Beetle Safety Reflectors are being used. (Lighting units supplied by Kurt Verson, Inc.)

1

2

3

1. In a New Britain, Conn., housing project, efficient lighting for many defense workers is assured by Beetle Safety Reflectors. This central ceiling unit is a 12" Beetle Safety Reflector. (Supplied by Lighting Division, Chase Brass & Copper Co.)

2. Bedrooms, too, must be properly lighted. This bedroom light at a New Haven, Conn., reclamation housing project is a 10" Beetle unit. (Supplied by Lighting Division, Chase Brass & Copper Co.)

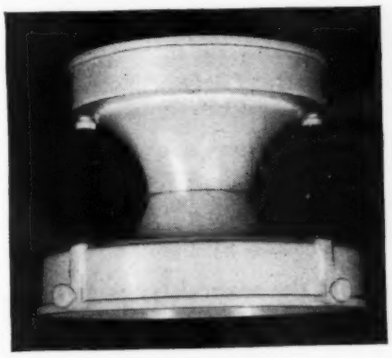
3. Bathrooms at Audubon Village are equipped with these 6" Beetle bowls which insure abundant, soft, glareless illumination. (Supplied by Kurt Verson, Inc.)

BEETLE* Safety Reflectors are being used to meet all demands for *efficient, low cost* interior lighting in the defense housing projects throughout the country.

For living rooms, bedrooms, kitchens and bathrooms, reflectors of this *shatter-proof, lightweight,* translucent plastic provide the correct illumination so necessary to the health and morale of our armies of defense workers.

Beetle Safety Reflectors are available in many designs in addition to those illustrated here — including the "Adapter-Type" reflectors for use with ordinary ceiling outlets where no more than a bare bulb is provided. Write now for a list of suppliers, further information.

*Trademark of American Cyanamid Company applied to urea products manufactured by it.



ALL PLASTIC CEILING HOLDER molded of opaque ivory Beetle will meet all needs for defense housing, and aid in the program for conserving copper and other metals. This unit meets Navy specifications. It can be furnished with pull-chain socket or Levolier switch. (Supplied by Lighting Division, Waterbury Button Co.)

AMERICAN CYANAMID COMPANY
Plastics Division
38 ROCKEFELLER PLAZA • NEW YORK, N. Y.

Beetle

LEADS WITH BETTER LIGHT

STANDARD OF THE WORLD
IRVINGTON INSULATION
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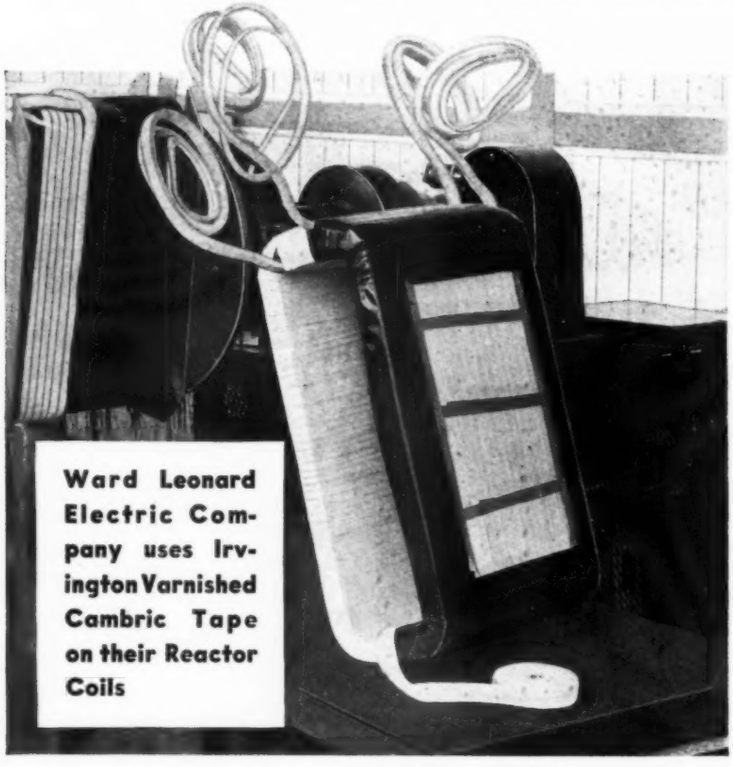
VARNISHED CAMBRIC AND TAPE

A TOUGH, UNIFORM, RESISTANT INSULATION

The many applications and superior qualities of IRVINGTON VARNISHED CAMBRIC AND TAPE have made them preferred items for electrical insulation by many manufacturers.



Ward Leonard Electric Company uses Irvington Varnished Cambric Tape on their Reactor Coils

Here is an insulation that is pliable, tough and highly resistant to abrasion, moisture, acids, and lubricating oils. Surfaces are uniformly smooth. Dielectric strength is excellent. Furnished in dry, tacky and oily finishes.

A few of the applications are: In sheet form on corners and between layers of field coils, as slot insulation for armatures and stators, between laps on end turns of armatures, as phase insulation for stators and as coil wrappers, etc. Suitable for application by hand or machine.

For more data on the several types and colors of IRVINGTON VARNISHED CAMBRIC AND TAPE

Write Dept. 96

Irvington VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U. S. A.

PLANTS AT IRVINGTON, N. J. and HAMILTON, ONT., CAN.
Representatives in 20 Principal Cities

Questions on the Code

[FROM PAGE 88]

ANSWER. . . No, this type of insulation is not expected to resist the solvent action of such liquids.

Interpretation No. 202

QUESTION. . . What is meant by the term "for service only" in the note following Table 4 of the 1940 edition of the National Electrical Code?

ANSWER. . . The intent is that only service conductors (see definition) may be installed in this manner.

Interpretation No. 203

QUESTION. . . Refer to sub-paragraph (b) of Section 4322, may two ⅓-hp, 220 volt motors (3.2 amperes each) be supplied by a 15 ampere branch circuit, the motors being without individual overcurrent protection?

ANSWER. . . No, it is the intent of the Code that such a motor branch circuit have overcurrent protection not exceeding 10 amperes. Paragraph (a) of Section 4343 applies.

Interpretation No. 204

STATEMENT. . . In a revamp to provide better metering conditions, two buildings separated by about two or three feet under common management and ownership were provided with a common service entrance. Proper control equipment for each occupant of both buildings was grouped on the service located in the basement of one building. It is open and accessible at all times to all tenants (apartments and stores) of both buildings. Individual feeders protected by separate fused disconnect switches at the service entrance were run, and terminate in fused circuit panels in each apartment and store.

QUESTION. . . Is the above described arrangement permissible under Article 230, Section 2306 of the 1940 National Electrical Code?

ANSWER. . . Yes.

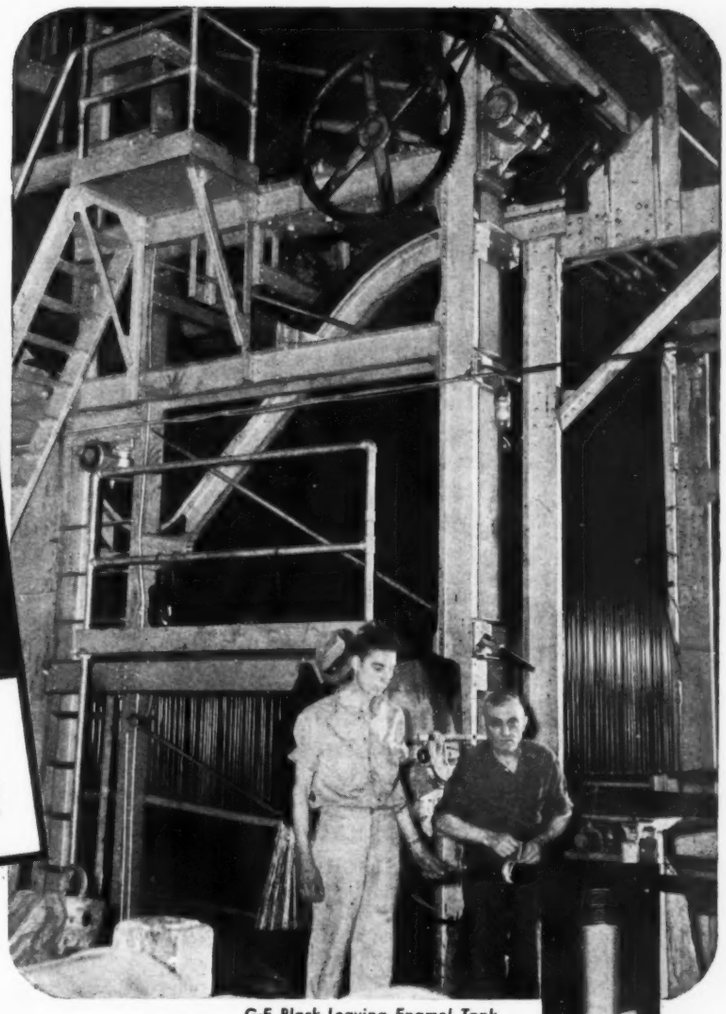
Interpretation No. 205

QUESTION. . . Does Section 3013 of the 1940 edition of the National Electrical Code permit the installation of conductors carrying currents of different characteristics such as AC and DC, and/or conductors carrying different voltages, in the same raceway or enclosure, without the use of barriers segregating the circuits, if all circuits are under 600 volts and all conductors are insulated from 600 volts or less?

ANSWER. . . Yes, provided none of the conductors are used for signal or radio systems.

F. P. Serene, Enamelling Supervisor, Day Shift, at the G-E Conduit Factory, New Kensington, Pa.

Mr. Serene started at the factory 20 years ago in the threading department. Work in other departments followed. Since 1927 he has been supervisor of enamelling and contributing operations. Sixty men work under him.



G-E Black Leaving Enamel Tank

G-E BLACK has protective coat of enamel

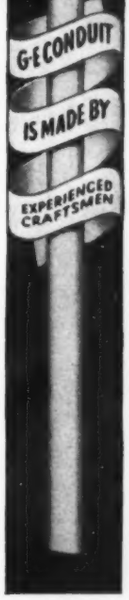
No. 3 of a Series—Men and Processes Behind G-E Conduit

G-E Black Rigid Conduit is made from easy bending, open-hearth steel tubing expertly processed by skilled workmen with long experience. Inspections and tests are made after each operation to insure uniform quality.

A tough, elastic, high quality enamel coating is baked on. It provides a durable corrosion protection where conduit is not exposed to weather or to excessive dampness. This coating is applied to carefully cleaned tubing by complete immersion, and adheres very tightly. It has uniform thickness on inside and outside surfaces. The glossy surface of this enamel assures easy, high speed wire pulling.

G-E Black is suitable for installation where no metal-coated conduit can provide adequate protection. Its enamel coating is chemically inert in the presence of corrosive liquids or fumes. When specifications call for chemical corrosion tests, compare G-E Black with any other coating.

For further information about G-E conduit see the nearest G-E Merchandise Distributor or write to Section C-18A, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.



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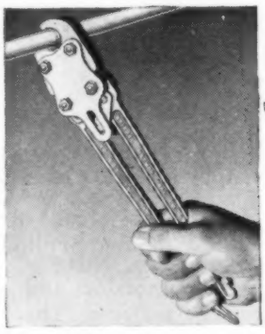
And there's just as much difference between the *streamlined* BRIEGEL METHOD of making connections and former old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials allowing you a larger margin of profit on each job. Make quick...easy...strong and neat connections this MODERN way.



No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only $1.25) and you have a smooth efficient job. Approved by Underwriters Laboratories.

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PREVENT SABOTAGE

SABOTAGE is a word that one is acutely conscious of these days. One never knows where, when or how it will strike and it's exceedingly difficult to detect the saboteur. The seriousness of this ever present threat is brought home by the interest and activity of the F.B.I. in surveying plants and making recommendations.

Any malicious attempt to tamper with the plant electrical system, production lines or other vital points, even if only partially successful, will disrupt production, lose time and seriously aid in the failure of our all-out efforts—just what we are trying to prevent.

How can we combat such conditions and threats? There are many places where the saboteur can strike, but there are numerous protective measures that we can employ. Constant vigilance together with the application of as many protective devices as are practicable, is the answer. Such devices include protective lighting systems for fences, yards and buildings; signal systems, intercommunicating systems and electronic control.

The following pages outline these points and discuss each in detail. And the Check Chart provides valuable data on protective lighting systems.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste
15. How to Save Power
16. Protection Against Sabotage (this issue)

Future articles will discuss—

17. Electrifying for Continuous Operation
18. Improving Working Conditions
19. Electrical Aids to Quality Control
20. Electrified Plant Housekeeping

PROTECTION AGAINST SABOTAGE

A COMPLETE investigation and clear understanding of the ways and means by which plant operation might possibly be interfered with is the prime requisite in any endeavor to provide protection. Sabotage is more than bombing. The malicious person within the gate can slow up or stop production just as would the enemy on the outside of an illuminated fence.

Sabotage can take place all along the line, so the problem of protection may be regarded in these aspects:

1—The damaging of plant and service facilities so that a plant simply could not begin to operate.

2—The retarding of production or the damaging of goods in production such as would result from the deliberate slow-up, the misplacement, theft or destruction of tools, or from the introduction of foreign bodies into the material under process; all to the end that plant operation would be inefficient.

3—Interference with the distribution of the finished product, as could be accomplished by the stealing of the product, or by the short weighing or switching of shipments to customers.

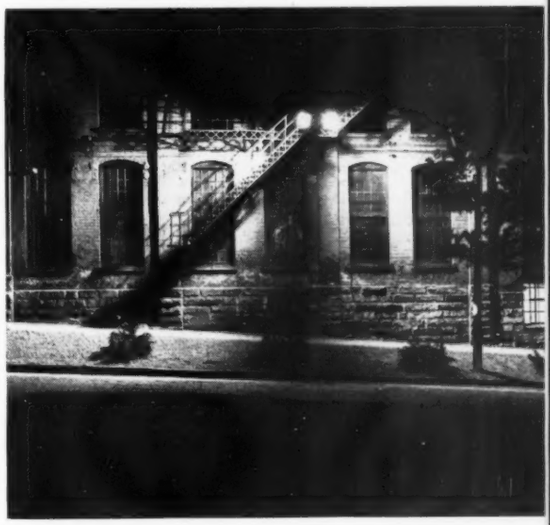
4—Injuries to workers; "accidents" and such acts as the infection of food and spread of disease.

The electrical man has several "sabotage" fighters, which he can martial to combat this enemy. These include—

Protected distribution
Protective lighting and fencing
Alarm, signalling and communicating systems
The electric eye
Controlled ventilation
Remote control
Instruments
Miscellaneous appliances such as black-light, electric etchers, etc.

Let us consider some of the applications for this apparatus by which damage can be prevented or detected.

Plants that are built up to the city street edge are particularly vulnerable to prowlers. Floodlighting protection is a simple job as shown here. However, the screens should be carried to the top of the windows.



1. Protected Distribution

To start at the source of power and considering that most plants purchase electrical energy, we can assume that steps have been taken to protect the supply lines to the customer because in this regard utility companies are cognizant of their responsibilities. In some localities special supplementary feeders are being extended to assure uninterrupted power flow to industries engaged in national defense production.

Transformer stations within manufacturing plants should receive special study and "padlocking". For example, in one instance the municipal authorities were prevailed upon to close-off a dead-end street which extended into the heart of the works and which left the outdoor transformer structure especially open to sabotage.

With regards to the electrical service, the combination of the use of two or more supply transformer banks plus reverse power protection on the service circuit breakers which feed the secondary buses, is a sound method of assuring continuity of supply, even though one bank is automatically taken out of service due to a transformer or primary cable fault.

The National Electrical Code no longer requires that all service be taken through one main switch. (See N.E.C. Section 2351.) Accordingly new switchboards may be designed to advantageously use up to six service switches, thus reducing the chance of all service being interrupted by switch operations.

Strange as it may seem, one plant producing essential aviation parts found that their service could best be ensured by providing proper motor protection. Motor troubles were resulting in repeated service outages. In this case decentralization was the answer, accomplished by a subdivision of the feeders into smaller circuits with isolating protection along the line, plus the installation of up-to-date motor control equipment. To complete the protection, this company has provided a 100 hp. gasoline-driven alternator connected at the switchboard to one side of the main double-throw switch, the regular utility supply constituting the normal feed.

With the supply sources protected as fully as considered advisable, reserve protection can be provided for by an adequate supply of poles, insulators and spare parts for the immediate replacement of services which might, notwithstanding our defensive efforts, be damaged.

A word about the protection of vital services other than electrical. Water supply systems, escape exits, etc., may all be given auxiliary electrical protection. For example—consider the fire fighting water supply for which water level indicators could provide an electrical warning should the tank that feeds the sprinkler system be partly filled.

2. Protective Lighting and Fencing

Light is the natural deterrent of the saboteur and darkness his ally. Yard and area dark spots can be eliminated. The lighted fence has had national acceptance as the first step in plant protection.

Local conditions of building layout and availability of electrical supply will dictate the design pattern of any system. For general guidance, however, these principles can be followed:

***SHADOW-PROOF** anti-sabotage lighting is furnished at the United Engineering Company's Wooster, Ohio plant by elliptical-angle reflectors on the building, and floodlights in the yard.*

(a) The lighting job must be so directed as to discourage entry. It must work to the guard's benefit by shielding him behind the glare of the light source, while subjecting the intruder to the glare.

(b) If entry is affected, the lighting coverage must be sufficiently complete as to make immediate detection possible.

(c) The installation must be reliable.

In any plant there will generally be four subdivisions of the protective lighting job based on location; namely, outside of the plant, at the fence, inside the yard, and special points. Many of the leading electrical manufacturers or utilities have worked out standardized recommendations which may easily be secured for specific jobs.

If there is no fence, then lighting can be installed to provide an illuminated area around the plant so approach cannot be made without detection. Fence lighting at the edge of the property can be accomplished by mounting floodlights on the buildings, mounting units close to and directing them along the fence, or by fence post units.

For yard and area lighting, there are many designs of floodlighting units from which selection can be made on the basis of coverage desired and the specific conditions of the area involved.

As a general principle, approach areas should be illuminated rather than the vulnerable "targets" themselves. Don't let a lighted window invite a stone or a bomb to some key point.

The particular circuit arrangement to be employed with a protective lighting layout will vary with location of units and power sources available. One arrangement to be recommended is to turn the lights on should the control circuit fail. In this scheme (the loop circuit) the ends of the circuit are connected to different feeders so as to overcome the possible outage that would result if the circuit were cut.

On the other hand, there is the blackout switch, or means to shut off all outdoor illumination from one point if the occasion should ever arise.

As for the wiring method, underground conductors with risers in the light posts or in conduit above the ground would offer best protection. If overhead wires are used, these should obviously be out of reach.

Another important point to be looked out for in protective lighting is "night" voltage, when because of light load and consequent lessening of voltage drop, the circuit voltage might go above the standard lamp rating employed in a plant and burnouts would become frequent. To overcome this possibility, small air-cooled auto-transformers can be connected to the circuit. Such units are rated 11½/23-115/230 volts, and at a 10 per cent voltage change, the ½ kva. unit is good for a 5.5 kva. transformation.

3. Alarm, Signalling and Communicating Systems

Where an alarm is needed all around a plant or building which house operations of especial importance, an electrically-sensitive circuit can be actuated by the wires of a fence. The system can be so designed as to give warning of interference at the particular point affected. For fire alarm needs there is available a system employing a small copper or monel metal air-filled tube which when installed around any area detects any rapid rise in temperature through air expansion actuation of the detector unit.

Communication systems are essential

MAINTENANCE GUIDE SHEET

FLOODLIGHT APPLICATION DATA FOR SABOTAGE PROTECTION

DESIGN DATA FOR OPEN AND ENCLOSED TYPE FLOODLIGHTS

The data in this table are calculated on beam efficiencies of 45%. When using floodlights having efficiencies other than 45% the foot-candle calculations given below should be changed accordingly so that they are directly proportional to the new efficiencies.

An allowance for depreciation of 30% has been made in these calculations so that with reasonable care the foot-candle values given can be maintained.

The initial foot-candle values will be 30% greater than these listed.

AVERAGE FOOT-CANDLES

	GENERAL SERVICE LAMPS								FLOODLIGHT LAMPS				MERCURY LAMPS	
AREA PER FLOODLIGHT (SQ. FT.)	100 WATT	150 WATT	200 WATT	300 WATT	500 WATT	750 WATT	1000 WATT	1500 WATT	250 WATT	400 WATT	500 WATT	1000 WATT	250 WATT	400 WATT
500–575	.9–.1	1.4–1.6	2.0–2.3	3.2–3.7	5.5–6.5	8–9	11–13	18–21	2–2.3	3.0–3.5	3.6–4.2	10–12	4.0–4.7	9–10
575–650	.8–.9	1.2–1.4	1.8–2.0	3.0–3.2	5.0–5.5	7–8	10–11	16–18	1.8–2.0	2.8–3.0	3.2–3.6	9–10	3.6–4.0	8–9
650–750	.7–.8	1.1–1.2	1.5–1.8	2.5–3.0	4–5	6–7	8.5–10	14–16	1.5–1.8	2.5–2.8	2.8–3.2	8–9	3.1–3.6	7–8
750–850	.6–.7	1.0–1.1	1.3–1.5	2.2–2.5	3.7–4.0	5.5–6.0	7.5–8.5	12–14	1.3–1.5	2.1–2.5	2.5–2.8	7–8	2.8–3.1	6–7
850–1000		.8–1.0	1.1–1.3	1.9–2.2	3.0–3.7	4.5–5.5	6.5–7.5	10–12	1.1–1.3	1.8–2.1	2.1–2.5	6–7	2.4–2.8	5–6
1000–1150		.7–.8	1.0–1.1	1.6–1.9	2.8–3.0	4.0–4.5	5.5–6.5	9–10	1.0–1.1	1.6–1.8	1.8–2.1	5–6	2.0–2.4	4.4–5.0
1150–1300		.6–.7	.9–1.0	1.4–1.6	2.5–2.8	3.5–4.0	5.0–5.5	8–9	.9–1.0	1.4–1.6	1.6–1.8	4.5–5.0	1.8–2.0	4.0–4.4
1300–1500			.8–.9	1.2–1.4	2.0–2.5	3.0–3.5	4.3–5.0	7–8	.8–.9	1.2–1.4	1.4–1.6	4.0–4.5	1.6–1.8	3.4–4.0
1500–1750			.7–.8	1.1–1.2	1.8–2.0	2.5–3.0	3.7–4.3	6–7	.7–.8	1.0–1.2	1.2–1.4	3.4–4.0	1.3–1.6	3.0–3.4
1750–2000			6–.7	.9–1.1	1.6–1.8	2.3–2.5	3.3–3.7	5–6	.6–.7	.9–1.0	1.0–1.2	3.0–3.4	1.2–1.3	2.5–3.0
2000–2250				.8–.9	1.4–1.6	2.0–2.3	2.9–3.3	4.5–5.0		.8–.9	.9–1.0	2.6–3.0	1.0–1.2	2.2–2.5
2250–2500				.7–.8	1.3–1.4	1.8–2.0	2.6–2.9	4.0–4.5		.7–.8	.8–.9	2.4–2.6	.9–1.0	2.0–2.2
2500–3000				.6–.7	1.1–1.3	1.5–1.8	2.2–2.6	3.5–4.0		.6–.7	.7–.8	2.0–2.4	.8–.9	1.7–2.0
3000–3500					.9–1.1	1.3–1.5	1.9–2.2	3.0–3.5			.6–.7	1.7–2.0	.7–.8	1.4–1.7
3500–4000					.8–.9	1.1–1.3	1.6–1.9	2.6–3.0				1.5–1.7	.6–.7	1.3–1.4
4000–4500					.7–.8	1.0–1.1	1.4–1.6	2.3–2.6				1.3–1.5		1.1–1.3
4500–5250					.6–.7	.9–1.0	1.2–1.4	2.0–2.3				1.1–1.3		1.0–1.1
5250–6000						.8–.9	1.1–1.2	1.7–2.0				1.0–1.1		.8–1.0
6000–7000						7–.8	.9–1.1	1.5–1.7				.8–1.0		.7–.8
7000–8000						.6–.7	.8–.9	1.3–1.5				.7–.8		.6–.7
8000–9000							.7–.8	1.1–1.3				.6–.7		
9000–10000							.6–.7	1.0–1.1						

Design data Compiled by Westinghouse

DO THESE THINGS

1—Plan your protective lighting for the worse possible visibility conditions so it will be adequate when sabotage would most likely be attempted.

2—Make lighting a disadvantage to the saboteur. If there is glare, be sure it blinds the intruder, not the guards.

3—Do not create shadowed areas in an attempt to illuminate other areas.

4—Put more light around the boundary of a property or at distant points if the guards are located in well-lighted areas. (Light in the foreground reduces distant vision because of contrast.)

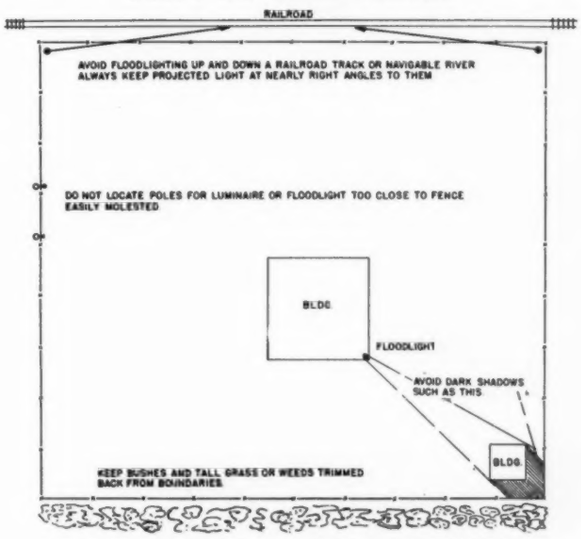
5—Keep all backgrounds as light as possible, paint fences and buildings in light colors.

6—Plan area lighting so that some light is contributed to any one point from more than one source. Thus a lamp failure will not set up an unduly dark or shadowed area.

7—Direct light across highways, streets, railroads and navigable waterways so that glare or brightness will not prove a hazard to traffic.

8—Keep as much of the lighting equipment as possible well within the property to prevent attempts to put it out of operation.

DON'T DO THESE THINGS


RAILROAD
AVOID FLOODLIGHTING UP AND DOWN A RAILROAD TRACK OR NAVIGABLE RIVER
ALWAYS KEEP PROJECTED LIGHT AT NEARLY RIGHT ANGLES TO THEM
OR
DO NOT LOCATE POLES FOR LUMINAIRE OR FLOODLIGHT TOO CLOSE TO FENCE
EASILY MOLESTED
OR
BLDG
FLOODLIGHT
AVOID DARK SHADOWS
SUCH AS THIS
BLDG
KEEP BUSHES AND TALL GRASS OR WEEDS TRIMMED
BACK FROM BOUNDARIES

"Do and Don't" data compiled by General Electric

to protection. It would be senseless to place a watchman in a gatehouse without the provision of means whereby that invidual could summon help. This need might be met by standard telephone service supplemented by an industrial howler so wired that it could be started from a number of stations, but could only be stopped by resetting a relay in some selected office. Obviously a system for emergency communication should not be dependent upon the lighting service voltage supply, because the lack of that supply might constitute the emergency. Battery-powered sets would be essential.

Where, because of noise, audible signals are of no value, then visible alarms should be adopted. These can be arranged with signal lamps of various colors and combinations of interruptions to give a wide range of messages.

4. The Electric Eye

The photoelectric relay and its accessories have almost unlimited applications in industry, providing ever watchful "eyes" to detect the passage of persons into forbidden places or to automatically control machine operations so that "miscounts" and defective pieces are automatically eliminated.

For "invisible" light which might be wanted to guard a passageway without being apparent, separate infra-red filters and holders are available.

Where critical operations are conducted and fine adjustments are called for, as in the setting of timing mechanisms and where the labors of many others could be sabotaged and lives later endangered, the use of phototube control should be considered, as an anti-sabotage agent. Such control reduces human error and increases productive and protective efficiency.

5. Controlled Ventilation

Records show that fires have been made more damaging on account of their having been spread by draft through ventilating and air conditioning ducts. Air conditioning fires have largely started around the filters. Fire doors and dampers should be arranged to close automatically upon the operation of a fusible link or other heat-actuated device. Fan control can be arranged to automatically shut down the fan when the temperature of the air becomes excessive, as from a fire. This is applicable in systems utilizing recirculation.

The maintenance staff should check each installation to be sure that it is equipped with one or more manual controls, located in conveniently accessible points, for quick shutting-down of the fan in case of fire. Also for use in the event that noxious gases were generated in the duct system through the deposition by malicious persons of chemical solutions or foreign bodies.

6. Remote Control

The application of multiple-station remote control of protective apparatus can be simplified by saying that additional stations to turn on protective circuits should all prove helpful, and that there should be a minimum of points where anyone bent on destruction could shut down protective apparatus. An illustration might be that the "off" control for fence-lighting should never be located in a watchman's shanty where a guard might be overpowered, although there would be no danger in so locating the "on" station. Remote control is essential for non-attended automatic machinery which might be open to damage.

This construction photo showing deeply buried electric conduits is an example of good practice against sabotage.

7. Instruments

In search for ways to increase the effectiveness of our protective force, instruments can be used to widen the scope of their supervision.

It might be vital that liquid or gas pressures be maintained between close limits. So an instrument might be set to indicate and record the operating conditions and to trip an alarm circuit before dangerous pressures are reached.

As an example of instrument application to prevent damage, electric tachometers can measure and record speeds of important apparatus where changes of speed affect the quantity or character of a product. They can indicate and record the speeds of conveyors to measure process time through various operations. By so doing they lessen the temptation to sabotage, especially where additional indicating instruments are placed in the superintendent's office.

8. Miscellaneous

Electric identification machines are facilitating the passage of proper persons into shops and factories. For one such machine it is claimed that it can produce complete identification passes or badges in a few minutes at a cost of but two cents per pass. Both subject and pass information are photographed simultaneously and integrally printed in one quick process on a card.

In the realm of "small potato" sabotage, the theft of tools is one of the most annoying practices. It is an effective way to slow up the works. The electric etcher, which can be used like a pencil for the permanent marking of tools, gages, dies and hard metal parts can be put to good use in so marking tools that thieves will be afraid to have them in their possession.

To get away from the possible fire, explosion and toxic gas hazards of liquid-filled apparatus, manufacturers have developed air-cooled transformers up to 15 kv. Such units controlled by air circuit breakers would provide an installation of high safety and one in which any higher cost might be justified if the apparatus could be placed close to the load and so be out of reach of the saboteur.

For spot detection of incipient fires, there are available heat-operated electric thermostats which operate on both the rate of rise and fixed temperature principles.

The loss of master drawings must be guarded. Equip vaults with electric detective and alarm devices.

Finally remember this: the maintenance force will need to be constantly on the job against an enemy who will always have the advantage of initiative.

We're in our 'teens, but—
we grew up almost overnight!

Yes sir, we had a healthy, normal plant growth for 'teen years, caused by industry's cordial acceptance of "3C" electrical control apparatus.

Then along came DEFENSE—and almost overnight we grew, and grew, and grew!

And did we have *"growing pains!"*

Even before windows were in place in our plant additions, new men, new machines, new devices, all blended with our standard production into a smooth-working schedule.

We don't make armament nor munitions, but we do make electrical control apparatus for use on motors and vital machines responsible for "all out" production.

Some difficulties? Sure, we have 'em—who hasn't?

Deliveries? We're making them—not as fast as we'd like—but who's doing any better?

We're *"in there, pitchin' "*—just as anxious as ever to service your electrical control needs, and your requirements are being given just as careful attention as possible.

Our *"grown-up"* facilities are at your service.

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CAPACITORS
FOR EVERY INDUSTRIAL NEED

Easy to install, reliable in service the FAST Dust Tight Unit is neat, sturdy, compact.

The unit is complete with fuses, discharge resistors, conduit box, knock-outs and mounting brackets.

The double container construction is a special feature.

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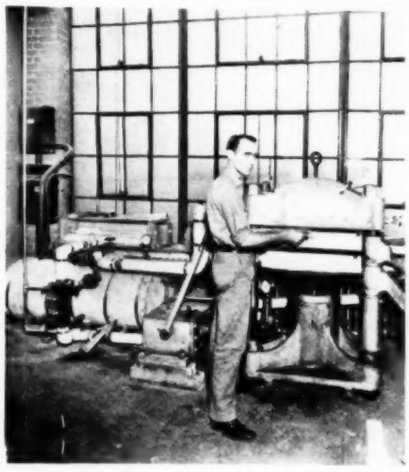
CAPACITOR SPECIALISTS FOR 22 YEARS
3119 N. CRAWFORD AVE. CHICAGO, ILLINOIS

Steam Needs Cut by Electric Heat

Steam for heating the vulcanizing press and for drying glue on envelope flaps was formerly supplied by the exhaust from the power plant. When central-station service replaced private generation, it was decided to adopt electric heat for the process steam requirements.

The efficiency of the electric steam generator is disclosed by the following record:

1. Maximum power required to heat



ARROW points to the small electric steam generator.

the boiler and press from cold is 30 kw. This is equal to approximately 90 lb. of steam per hour.

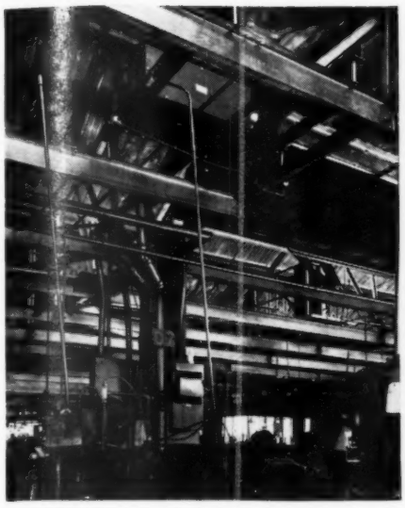
2. Average consumption after the press is brought to temperature is 7 kw., equal approximately to only 21 lb. of steam per hr., which shows that the electric boiler is carrying the load at only 40 per cent of the original energy input.

Power Factor Raised

Power factor was low at the plant of the National Acme Company, Cleveland. Purchasing power on a monthly kva. demand basis, the plant's low power factor was responsible for a higher than average monthly power demand charge. The low power factor was caused by a number of induction motors running underloaded. It caused poor voltage regulation at ends of power feeders resulting in poor motor performance and feeder heating.

Capacitors, installed up in the roof trusses, have cut the power costs nearly $315 per month and raised power factor from 69 to 95 per cent. The 720 kva. units will completely pay for themselves in eighteen months.

Since installation, the performance of the motors has noticeably improved

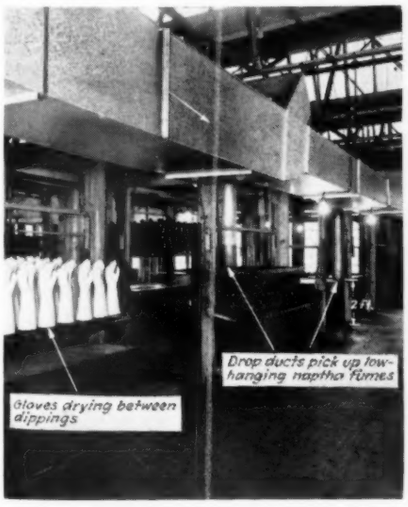


TYPICAL of the eight banks of capacitors. They are located in roof trusses to conserve valuable floor space. General Electric photo.

because voltage conditions at motor ends of the feeders are much steadier. Useless or wattless current elimination has done away with current overloads on the feeders and has made extra feeder capacity available for use when needed.

Air Conditioning Reduces Rejects

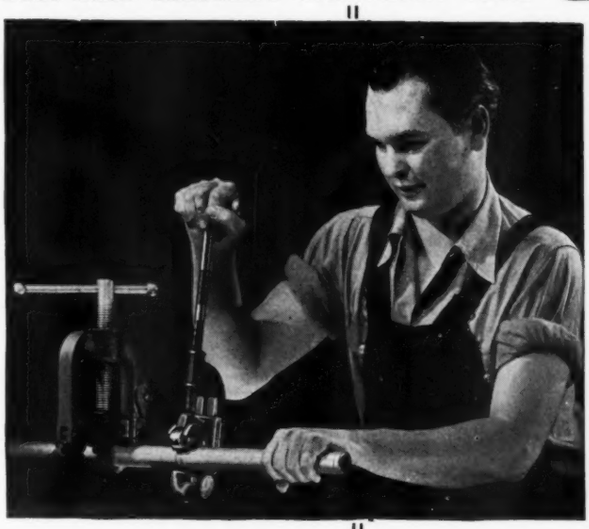
With operations requiring several hours in the manufacture of rubber gloves, weather changes would interfere with uniformity and quality and often upset production schedules. Wilson



ARROWS point to duct which handles conditioned air for the room.

Rubber Glove Co., Canton, Ohio, met this problem by air conditioning the operation for an even temperature of 85 deg. F. and relative humidity of 50 per cent.

Beat Rush Schedules with Faster Tools



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Special Forged Cutter Wheels Assure You Faster Cleaner Pipe Cutting

RIDGID heavy-duty cutter — 4 sizes, capacities to 4"... Also No. 42 with 4 wheels, for work in close quarters

MEN ARE WILLING—give them the help of the speediest most modern tools and watch them "deliver ahead of schedule."

Everywhere you find these efficient RIDGID Pipe Cutters by hundreds of thousands cutting all kinds of pipe and conduit more easily and quickly. They save cutting and reaming time. That unusual blade type wheel—forged and assembled in solid hub—sets new speed and endurance standards.

Heavy-duty type, these cutters are *guaranteed* to cut true. For the economy of more work and less expense, ask your Supply House for RIDGID Cutters.

THE RIDGE TOOL CO. ELYRIA, OHIO

RIDGID
WORK-SAVING PIPE TOOLS

Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

PHOTOELECTRIC LIGHTING CONTROL

QUESTION 27. When installing a photo electric cell for school classroom lighting control, should the photo cell be installed on the wall opposite the windows and facing them? Or, should it be installed on the outside wall between windows and in direct line with fixtures to be controlled?—B.E.S.

A. TO QUESTION 27. The function of a photoelectric cell is to turn on lights when natural illumination falls below a predetermined level. It should be installed as close as possible to the fixtures it controls and in the path of natural lighting. The cell may be located on the inside wall facing the windows or on the front wall whichever is nearer the fixtures. It should not be installed on outside walls, between windows, since this location is the darkest in the room and least sensitive to variations of natural illumination.—L.M.K.

A. TO QUESTION 27. The phototube should be mounted to receive natural illumination through the windows. The room unit is usually mounted on the side wall in line with the row of lights it controls. In wide rooms it may be necessary to burn the inside rows of lights continuously and apply the photoelectric control only to those nearest the windows.—D.H.B.

A. TO QUESTION 27. The photoelectric cell for controlling the lights in a school classroom should be installed on a wall opposite the windows and facing them. In general the cell should be located about one-third of the way back from the front of the room. It should be shaded from the direct light of the lighting unit, otherwise, when the artificial lights are turned on, there may be enough additional light falling on the cell to result in turning off the light.

The best location for the cell might vary somewhat with the location of blackboards and of other features of the room.—J.E.W.

A. TO QUESTION 27. I assume the photoelectric cell is to be used to supplement natural lighting by acting as a pilot to switch on the room lighting. In this case the cell must be placed on the opposite wall facing the windows so that it will receive illumination only from the natural or window source. The cell must be shielded from illumination from the artificial lights, for the increased illumination from that source, if allowed to act on the cell, would immediately cause it to switch off the electric lights. The cell can then be so adjusted (by means of regular controls) that when the natural lighting falls below the desired level the electric lighting will be switched on.—W.B.M.

MERCURY SWITCHES

QUESTION 28. In the use of mercury for time delay switches, and the usual mercoid switches, the inside of the mercury cylinder in time becomes coated with a dirty film, and this film hinders and impairs the operation of the device. Since the cylinder is air tight, how can the film accumulate? How can it be prevented?—W.E.J.

A. TO QUESTION 28. True, the cylinder is air tight, but it is humanly impossible to remove all the air before it is sealed. This small quantity of air in the cylinder causes oxidation and the dirty film mentioned. The amount of current and the number of interruptions determine how quickly the film accumulates. It cannot be prevented. If these mercury cylinders are not loaded beyond their rated capacity it is usually quite some time before the film appears.—R.B.

A. TO QUESTION 28. Mercury sealed in a glass or metal tube should not have a dirty film form on it. The absence of any oxygen should prevent oxidation of the mercury or burning of the contacts.

A small leak in the glass or metal tube however, would allow air to enter, oxidize the mercury and form a film on the surface. The contacts would also burn away and deposit on the surface.

Over a long period of time oxides may be liberated from either the glass or metal tube but this should not be in quantities that would impair switch operation.—R.C.M.

A. TO QUESTION 28. The formation of the film on the glass of the mercury bulb is caused by the oxidation of the mercury within the tube. This oxidizing process can be attributed to the presence of a small amount of oxygen reacting to the electric arc.

To my knowledge, this film does not hinder the operation and efficiency of the mercury tube. There is no remedy to remove this film once it has formed.—I.J.L.

A. TO QUESTION 28. In the great majority of cases mercury switches function efficiently for a long time. However, the time limit is dependent upon the character of service, including the number of operations, the temperature and the rate at which the circuit is closed and opened. This rate factor is a cause of trouble because it determines the length of time for the arc to extinguish and the time for the making of contact of the electrode. Regardless of the pressure within the cylinder, whether air-tight or partially evacuated, there is this condition of heat and burning at the electrode and contact surface of the mercury. This burning effect, which also includes ionization, generally causes a chemical change. The chemical change results in the discoloration on the surface by the various

Century Open Rated General Purpose Motor.
Century Totally Enclosed Fan-Cooled Motor for surroundings hazardous to ordinary motors.
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At Right—Century Repulsion Start Induction Motor for hard-to-start loads.

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When you select, buy or sell a Century recommended motor, you can rest assured that the motor has been *Job Selected* to fit its particular application. You know that it meets the demands of the job and the conditions under which it must operate.

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Century Job Selected Motors are made possible because of Century's wide range of motor types and sizes, from fractional to 600 horsepower — each type designed and engineered to meet the requirements of a specific job.

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SPRING-WING TOGGLE BOLTS

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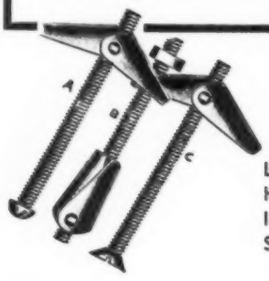

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You simply slip the toggle through bolt hole and each wing springs automatically to anchoring position to assure secure fastening where either or both wings can spread. Wing edges engage bolt thread firmly when tightened to prevent bolt from turning. 9 different head styles meet all requirements. Ask your Supplier and Write for catalog.

NEW PAINE TOGGLE BOLT CLAMP

LOOK FOR THIS CLAMP IN YOUR NEXT BOX OF PAINE TOGGLE BOLTS

WORKS TWICE AS FAST

A remarkable new invention that slips over bolt thread and holds toggle tight against inside of wall so bolt can be tightened with screw driver. Look for this CLAMP in your next box of PAINE Toggle Bolts—it's FREE.

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Reader's QUIZ

[FROM PAGE 100]

substances involved. These are mercury, a minute quantity of oxygen, the components of the electrode and glass.

The total elimination of this discoloration may not be accomplished. For the maintenance engineer there remains no alternative except to apply a suitable type for each particular duty.—O.A.

SHUNT FIELD RELAY TROUBLE

QUESTION 29. I have been having trouble with shunt fields protective relays dropping out at times on our control boards, controlling direct-current compound wound motors. I believe it was due to the series field neutralizing the shunt field for an instant during heavy current peaks of the motor.

I tried using a heavy copper collar around the cores of the protective relays. Do you think a condenser across these relay coils to delay these relays would help? —H.J.A.

A. TO QUESTION 29. The use of condensers across relay coils to delay the opening of the contacts is used a great deal where the circuit is opened and the condenser discharges through the relay coil. In your case it would not do to open the shunt field circuit. When your field neutralizes at peak loads the condenser would discharge through the field as well as the relay coil. Possibly most of the charge would go through the field and armature.

I would suggest you use a relay with an oil or air dash pot so you can control the opening time of your contacts over the peak loads. I have used time delay relays for similar conditions.—W.R.

A. TO QUESTION 29. I think your major trouble is due to too much drop in line voltage during the peak loads, thus allowing the shunt field protective relays to drop out. If the cores of these relays are not operated near the saturation point of the iron, this condition may be helped by adding a few more turns to the relay coil, if it is connected in series with the shunt field. If the coil is connected across the line in series with a resistor, the resistance may be slightly

Pylet with Midget Triploc plug and receptacle

PYLETS

Find out about the improved features of Pylets that help you save time and labor and get a better wiring job. Available in standard and explosion-proof types.

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Glass and Unbreakable types for every application. Stops guesswork - bearing failures- waste- idle machinery, etc,

WRITE FOR FOLDER No. 300

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

decreased if the operating temperature of the coil will permit it.

I don't think a condenser connected across the coil would prevent the relays from dropping out.—L.H.M.

A. TO QUESTION 29. Shunt field protective relays must have enough ampere turns to operate. Therefore, a damaged relay coil, an opening in the shunt field circuit, or a low line voltage, will affect their operation.—H.S.

Can You ANSWER *these* QUESTIONS?

QUESTION D1.—Our portable conveyors, driven by 2 and 3 hp., 3-phase motors can be plugged into any one of 10 receptacles, connected on four circuits from two distribution panels. Receptacles are non-reversible and motor terminals must be changed to obtain correct speed rotation when some receptable connections are made. How can the same direction of rotation be obtained for all plug-in connections?—R.M.S.

QUESTION E1.—What will protect a commutator from a chlorine atmosphere?—L.W.B.

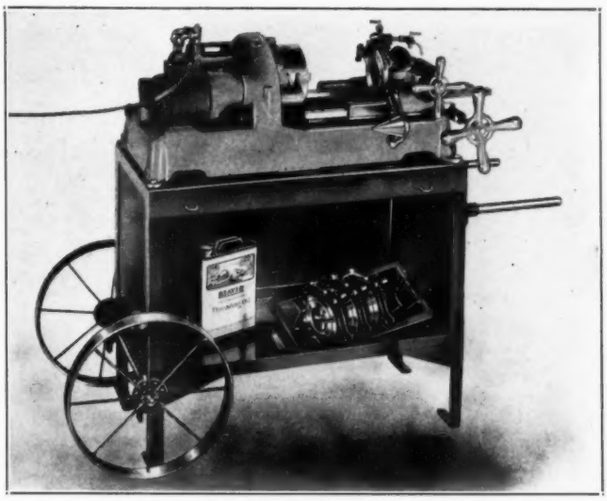
QUESTION F1.—How is the necessary-resistance for a field rheostat computed, for a direct current adjustable speed motor and for a constant speed motor, to increase the speed 25 per cent?—H.R.S.

QUESTION G1.—If new windings in electric motors should successfully stand a high potential test of twice normal voltage plus 1000, what is the proper value to use for motors that have been operating for some time, the motors being thoroughly clean and dry?—R.C.M.

QUESTION H1.—Will you please tell me how to test ballasts, compensators and starter switches for fluorescent lighting equipment?—J.H.F.

QUESTION J1.—Four banks of 3-phase, 440-volt capacitors of 100 kva. each were put in two different places to improve power factor in our plant—three banks in one spot and one bank in the other. Each bank is controlled by a fused 200 amp. safety switch and each of the 10 capacitors in the bank has two 30 amp. fuses. Lately we have had trouble keeping these fuses from blowing out. No short, leak or ground is evident. The cables connecting capacitors and switches are warm but not hot. What is the cause and what is the best way to service them?—J.J.M.

PLEASE SEND IN YOUR ANSWERS BY DECEMBER 1



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Beaver Model-B

⅛ to 2-inch Pipe and Bolt Machine

For ⅛ to 2-inch pipe—¼ to 1½-inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.

Write for Bulletin B.

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● Bunting Bronze Bearings for almost every purpose, completely machined and finished, ready for assembly, are obtainable instantly from local wholesalers. Every size and make of electric motor can be serviced by these Bunting Standardized Bronze Bearings. Also machine tools and all kinds of industrial machinery.

Bunting Precision Tubular and Solid Bars of Bearing Bronze also are available from stock in hundreds of sizes for your convenience in machining special bronze bearings or parts. Ask your local wholesaler. Write for catalog. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

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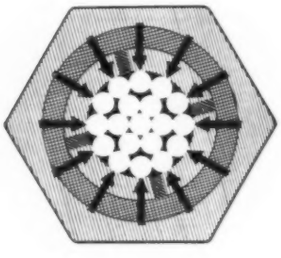
You can't make a good water connection by pressing at two points.

But give it a good "Gorilla Grip" all around and you will have a tight positive connection.

The same applies to mechanical electrical connectors.



Cross Section of "Gorilla Grip" Connector

National Electric "Gorilla Grips" have 100% all around contact - not just two spots.

Pressure is uniformly distributed over full contact area of the Conductor and there is a "Gorilla Grip" for every Conductor, no matter where it terminates. "Gorilla Grips" can be used over and over again Emergency stock sets available or assembled to meet your needs with required fittings.

Write for descriptive booklet.

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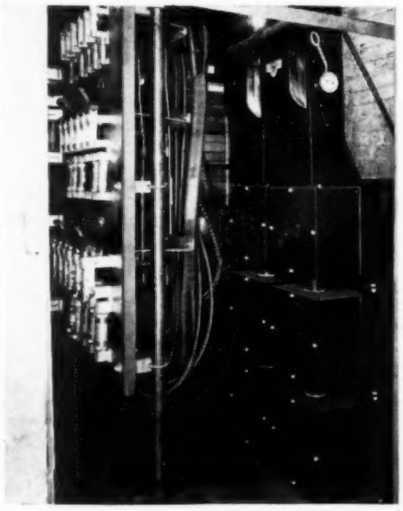
Feeder Capacity Increased

Automatic coal stokers are manufactured at the Iron Fireman Company, Cleveland, and the heavy electrical load consists of machine tools constantly on and off the power supply. Low load factor of the driving motors created a low power factor condition and was directly responsible for an excessive power demand charge.

Many improvements in plant operation were made by installing a battery



INSTALLED at distribution points. To conserve space, the capacitors and their disconnect switches are mounted on the wall back of the distribution board.

of capacitors. These capacitors placed at the electrical distribution centers, have reduced monthly power bills by six per cent. In addition, the units totalling 157½ kva., have raised power factor from 70 per cent to a near unity value of 97 per cent. Most important thing accomplished was the release of extra feeder capacity that formerly was unavailable because of useless wattless current.

Based on six per cent monthly savings in power bill the capacitors will pay for themselves in approximately 36 months.

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At the Smith, Kline, and French Laboratories, Philadelphia, individual drives and small group drives on related equipment replaced a single group drive system.

Where several machines, such as mixers or tumblers, are operated at the same time, a portion of the former line shaft has been retained. It is direct-coupled to a geared motor. The motor is mounted on a wall bracket and lined up with the shaft.

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CAPACITOR SELECTOR

Be sure you have the right capacitor for the motors you repair. The new Mallory Capacitor Selector will tell you accurately every time whether or not a capacitor is needed and give you the correct size to use.

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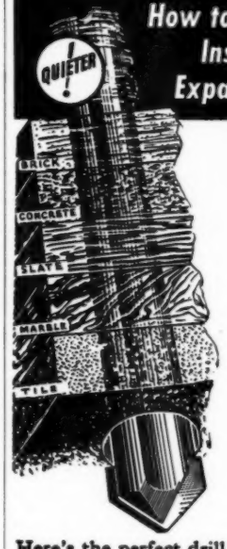
How to SPEED-UP Installation of Expansion Anchors



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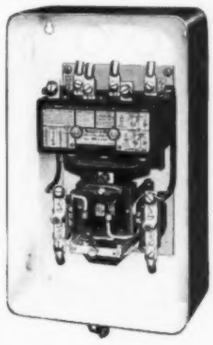
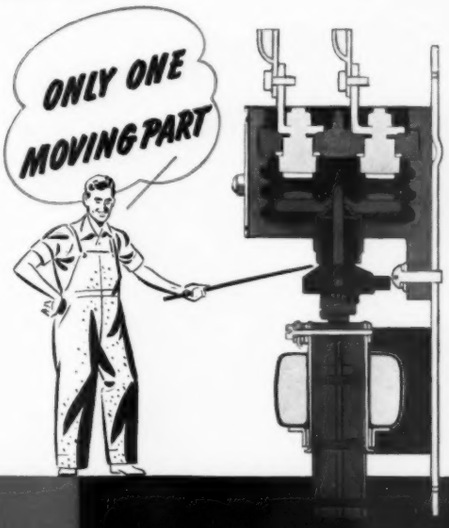


Bulletin 709 Size 2 solenoid starter with cover removed to show accessible terminals, solenoid switch, and accurate overload relays.

"So you like that up-and-down solenoid motion to run your new cookie cutter"

The straight-line, up-and-down motion of Allen-Bradley solenoid starters is the key to their remarkable, maintenance-free performance. In this type of switch there is only one moving part . . . the vertical plunger which carries the double break moving contacts. There are no flexible jumpers to break. There are no pins, pivots, or bearings to stick and cause trouble. No automatic starting switch now on the market is so simple and so trouble-free.

Allen-Bradley manual starters operate on the same straight-line principle. They are equipped with the same silver alloy contacts that never need cleaning, filing, or dressing. Accurate overload protection is a standard feature in all across-the-line switches, automatic or manual. And there is always lots of room for wiring in the cabinets.



Sectional view of Bulletin 709 Size 2 solenoid starter showing plunger, moving and stationary contacts, and the enclosed arc hood.

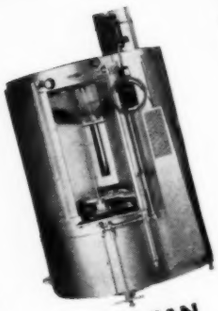
A-B

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

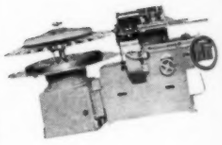
QUALITY

THE MANUAL STARTER for 1,001 JOBS



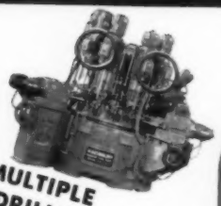
MILK CAN WASHERS

DRILL PRESSES



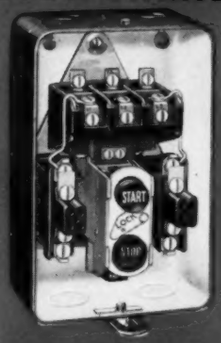
BAG SEALING MACHINES

BOTTLE FILLERS

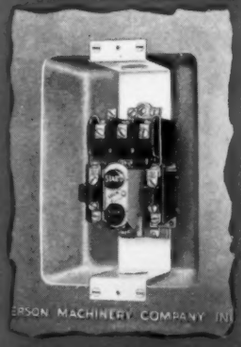


MULTIPLE DRILLS

BULLETIN 609 MOTOR STARTERS



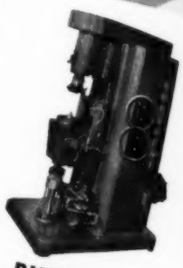
This open view of the Bulletin 609 hand-operated motor starter shows the compact switch mechanism mounted in the standard general-purpose enclosure.



The above illustration shows the Bulletin 609 starter arranged for flush mounting in a machine base or wall recess.

Allen-Bradley Co.
1307 S. First St., Milwaukee, Wis.

ROTARY SHEARS



BURRING MACHINES

GRINDERS

TOOL GRINDERS

CUTTER SHARPENERS

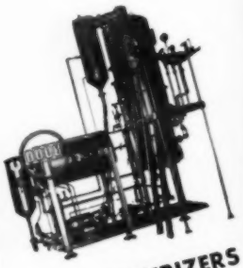
FILTERS

METAL CLEANERS

WRAPPING MACHINES

MULTIPLE SPINDLE MACHINES

WOOD BORING MACHINES



PASTEURIZERS

WASHERS AND DRYERS

THREADING MACHINES

ALLEN-BRADLEY

BULLETIN 609 HAND-OPERATED MOTOR STARTERS

QUICK-MAKE QUALITY QUICK-BREAK

Estimating

INSTALLING SQUARE DUCT SYSTEM

Power distribution for a recent addition to an eastern tool manufacturing company plant was accomplished by the use of a square duct raceway system. The M. B. Foster Electric Company of New Haven, Conn., installed the duct on the under side of the steel beams running the length of the plant addition. L-shaped sheet steel brackets were made to bring the duct to the proper mounting height. These brackets were bolted to the regular duct mounting collars and fastened to holes drilled in the beam flanges.

The following is the labor breakdown for mounting the duct.

INSTALLING THE DUCT — includes making the L-shaped mounting brakets, drilling the steel beams, coupling and mounting approximately 180 feet of duct about nine feet above the floor.

Total time ..... 72.0 m. h.
Avg. time per foot..... 0.4 m. h.

PULLING CABLE—includes cutting and laying three No. 1 rubber covered feeder cables in the duct. No branch circuit work is included.

Total time ..... 8.0 m. h.

The above time is offered only as a guide for similar installations. Individual job conditions enter into each estimate and must be carefully considered.

FEEDER CONDUIT ANALYSIS

As labor units are made up to apply to convenient material lists, they frequently combine a number of distinct and separate operations which must be considered individually on unusual jobs. The Electrical Contractors Association of Chicago has prepared an analysis of the several operations on feeder conduits which contribute to the familiar average labor units in common use.

The unit for feeder conduits includes the following operations, according to this study:

1. Study time, ordering and checking material required.
2. Unloading and delivery to a convenient and safe storage room or area.
3. Moving from the storage space to the point of installation or the pipe bench.
4. Setting up and handling tools required for cutting and threading.
5. Cutting conduits, including making the necessary measurements.
6. Cleaning threads, (if necessary) and threading conduit, estimating five threads for each 100 ft.
7. Installing the conduit, not including elbows or offsets.
8. Installing elbows and couplings estimating an average of two elbows per 100 ft.
9. Making and installing offsets in conduit.
10. Making connections at pull boxes or cabinets, estimating an average of two such terminals per 100 ft.

This type of analysis is particularly valuable in setting up special units for unusual layouts, for instance, jobs requiring long parallel runs without bends or, the opposite extreme, numerous elbows and offsets in each run. By altering the sub-unit for the affected operation the special unit needed can be quickly and accurately derived.

The total units shown in the accompanying table do not include fastenings and hangers as these items are usually entered separately in the material list and therefore carry separate labor units.

Data from Electrical Contractors Association of Chicago.

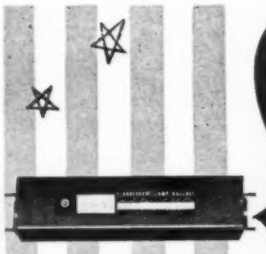
TABLE I

APPROXIMATE DISTRIBUTION OF LABOR FOR FEEDER CONDUIT UNITS

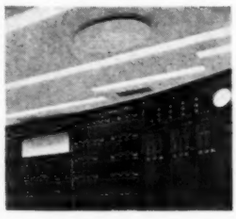
Conduit Size	½-in.	¾-in.	1-in.	1¼-in.	1½-in.	2-in.	2½-in.	3-in.	3½-in.	4-in.
			Division of Time — Hrs. Per 100 Ft.							
	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.	Hrs.
Study Time Ordering and Checking	.20	.22	.30	.35	.40	.45	.45	.45	.50	.60
Unload and Deliver to Storage Space	.08	.10	.18	.30	.40	.50	.80	.90	1.10	1.40
Moving From Storage To Point of Installation	.08	.10	.18	.30	.40	.50	.80	.90	1.10	1.40
Laying Out Runs and Measuring	.75	.80	.80	.80	.90	1.00	1.10	1.10	1.20	1.50
Setting Up and Handling Tools	.10	.10	.14	.30	.30	.40	1.00	1.00	1.25	1.50
Cutting Cond.— Includes Meas. 3 cuts per 100 Ft.	.20	.23	.60	.70	.80	1.20	1.80	2.25	2.70	3.50
Threading 5 Threads Per 100 Ft.	.75	1.00	1.30	1.95	2.40	3.50	3.20	6.60	8.00	10.75
Installing Conduits	1.00	1.25	1.55	2.00	2.50	3.50	4.70	5.70	6.75	9.00
Install Ells and Coup. 2 Per 100 Ft.	.35	.50	.60	.70	.80	1.25	1.60	2.00	2.50	3.25
Offsets — Making and Installing	.34	.50	.90	1.10	1.75	2.25	3.00	3.50	4.20	6.00
Connections at P.B. or Cabinets—2 per 100 Ft.	.15	.20	.25	.30	.35	.45	.55	.60	.70	1.10
TOTALS	4.00	5.00	7.00	8.80	11.00	15.00	21.00	25.00	30.00	40.00

INDUSTRY *for* DEFENSE

finds these SOLA transformers essential



for FLUORESCENT LIGHTS



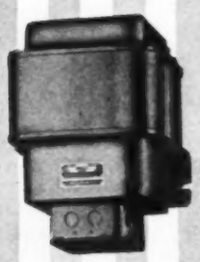
Specified and used in many important air fields and defense plants, Sola fluorescent lamp ballasts guard against untimely failures and costly production delays. Their efficiency prevents excessive drain on already overloaded supply lines. Their small size permits use of compact fixtures, releasing excess vital materials for other use. Standard or constant voltage units available in single or 2-lamp capacities.

Ask for bulletin JFL-86

for MERCURY LAMPS

The uniformly high power factor (98%+) of Sola Mercury vapor lamp transformers imposes no wattless load on power systems. Completely independent of line voltage changes, they prevent lamp outage due to line voltage drops. They increase lamp life by insuring perfect lamp operation regardless of line voltage levels, and automatically protect supply circuits and fuses from disruption should lamp failure occur.

Ask for bulletin JMV-81



for POWER and CONTROL

It is far more economical to operate tools, power jigs and independent lighting circuits from higher voltage power lines. Where existing service lines are already loaded to maximum, their capacity can be increased by supplying them at higher voltages using Sola transformers to reduce the higher voltages to lower voltage levels. Air-cooled, double wound and auto types—.050 to 25 KVA—housing or encased types. Rugged heavy duty types specially designed for lighting and general power applications.

Ask for bulletin JPC-14

LISTED BY UNDERWRITERS LABORATORIES

SOLA ELECTRIC COMPANY

TRANSFORMERS

2525 CLYBOURN AVE., CHICAGO, ILL.

Estimating

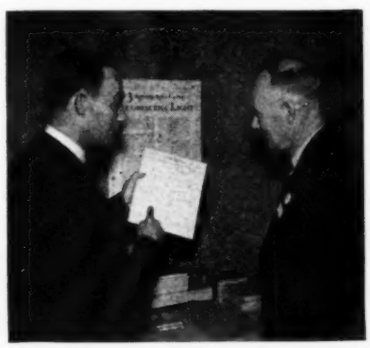
[FROM PAGE 107]

MESSENGER MOUNTED FLUORESCENT FIXTURES

During a recent electrical modernization of an industrial plant, the J. S. Nielsen Electric Company, electrical contractors of New Haven, Conn., were faced with the problem of installing rows of suspended type industrial fluorescent fixtures at right angles to the steel roof trusses.

They decided to use a messenger cable supported by eye bolts and turnbuckles at the building walls and clamped to the under side of the roof trusses. Since the trusses were on 20-ft. centers, intermediate messenger supports were necessary. This was accomplished by using a catenary messenger cable, looped over the top of the lowest member of the truss and clamped to the suspension messenger at the intermediate points. The suspension messenger supported both the branch circuit conduit and the fixtures.

Fixture connections to the circuits were made through plug caps and "C" type conduit fittings with receptacle covers. The conduit fitting was equipped with a cast double-C clamp type fitting, the upper part of which fitted over the messenger cable while the lower part engaged the chain or saddle-bolt fixture suspension. Fixtures in different parts of the plant were at different mounting heights. Those mounted close up to the messenger were suspended by U-type saddle-bolts fastened to the mounting ears of the unit. Those with a lower mounting height were suspended from the messenger by sash chain and S hooks. The bottom of the trusses were



***BUSINESS FORMS** for the contractor speed office routine and plug losses, C. E. Stephenson of the Minnesota Electrical Council explains to H. E. Dudrey, electrical contractor of Moorhead, Minn. Social security legislation and labor laws have created special interest in systems for keeping accurate and readily accessible payroll records.*

approximately 10 feet above the floor. The installation was made from step ladders while machinery was being moved into the building.

The following is a breakdown of the labor made by the contractor for future reference.

INSTALLING MESSENGER CABLE—includes drilling holes in the building walls, dead-ending on roof trusses where necessary, mounting the messenger and the supporting catenary cable. There were nine runs of approximately 180 feet each. Cable clamps were used throughout on the 3/8-inch cable. Floor space was clear.

Total time	144.0 m. h.
Avg. time per run	16.0 m. h.

FABRICATING SADDLE BOLTS—includes the shaping of 500 short U-type saddle bolts for fixture suspension.

Making a jig	4.0 m. h.
Shaping 500 bolts	8.0 m. h.

FABRICATING CHAIN SUSPENSIONS—includes cutting the sash chain into 4-ft. pieces, also the short pieces to form the Y at the fixture and mounting same to 50 fixtures with S hooks.

Total time	8.4 m. h.
Avg. time per unit	10 minutes

INSTALLING CONDUIT—includes cutting, threading and mounting fittings and suspending from messenger cable.

Average time per 100 feet	5.0 m. h.

INSTALLING CIRCUIT CONDUCTORS—includes the necessary cutting, skinning and pulling in of the No. 12 wires in the conduits.

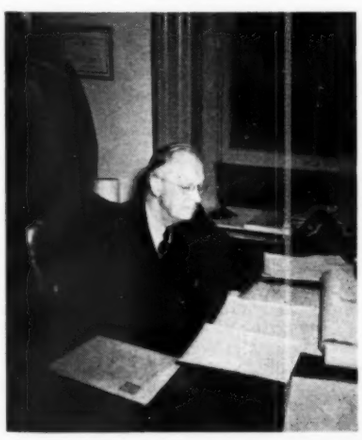
Average time per 1000 ft. of wire	6.0 m. h.

INSTALLING RECEPTACLES—includes skinning the wires, connecting the receptacle and mounting to the conduit fitting.

Average time per 100 units	25.0 m. h.
Average time per receptacle	0.25 m. h.

MOUNTING FIXTURES—includes making up the cord extensions, attaching the plug cap, connecting to the fixture leads, mounting the fixture to the messenger cable hooks and plugging into the receptacle. All of the 275 fixtures installed were delivered on the job with auxiliaries completely wired.

Total time	275.0 m. h.
Average time per fixture	1.0 m. h.



CONSULTANT—George Davis of the A. L. Davis Electric Co., handles the engineering and consulting phase of the business while his son Arthur handles the electrical construction.

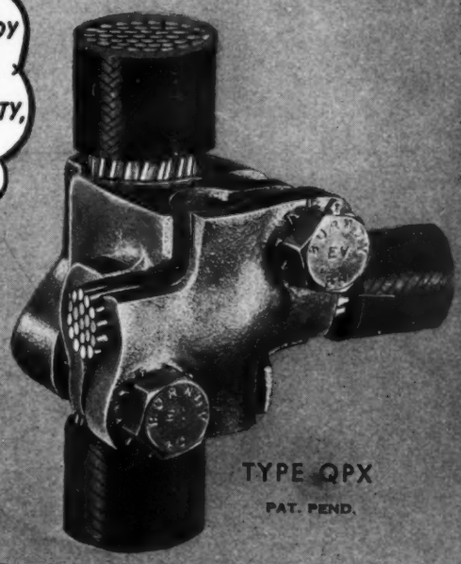
INTRODUCING THE

VERSITAP

ONE CONNECTOR

FOR USE AS A TEE, LINK, CROSS OR PARALLEL CLAMP...TAKES WIDE RANGE

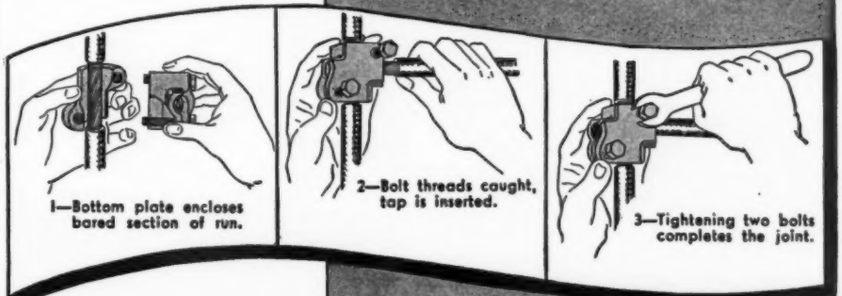
AT LAST SOMEBODY WORKED IT OUT... HIGH ADAPTABILITY, LOW PRICE!



TYPE QPX

PAT. PEND.

Keeps connector stocks small . . . Installed with a wrench, compact . . . Prevents cable bending on offset taps . . . High strength, conductivity copper alloy . . . Ten sizes cover any of 814 joints.



1—Bottom plate encloses bared section of run.

2—Bolt threads caught, tap is inserted.

3—Tightening two bolts completes the joint.

HAVE YOU CATALOG 41!

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BURNDY ENGINEERING CO., INC.

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A SINGLE VERSITAP HANDLES THESE CONDUCTOR SETUPS

SEE YOUR WHOLESALER ABOUT

BURNDY CONNECTORS

In the News

SPAB BANS NON-ESSENTIAL BUILDING

The Supply Priorities and Allocations Board announced a new policy. Under it no public or private construction projects which use critical materials such as steel, copper, brass, bronze, aluminum, etc., may be started during the emergency unless these projects are either necessary for direct national defense or are essential to the health and safety of the people.

This applies to the building of post offices, courthouses, and similar structures; roads and highways; to river and harbor improvements; and to flood control and power projects. It applies to the construction of factories, lofts, warehouses, office buildings and all other commercial construction. It applies to residential construction and to construction for public utilities.

SPAB pointed out that because of the defense program's heavy demand for metals it will not be possible for the United States to build all of the warships, planes, tanks and other things essential to its national security if the scarce metals are used in building projects which are not vital to defense.

Where construction actually has started and a substantial portion has been completed, SPAB said, efforts will be made to get the critical materials needed to finish the job.

The entire policy, SPAB held, is based on the fact that no construction job which is not absolutely necessary is entitled to a share of the materials urgently needed for defense. If factories are obliged to close because they cannot get these materials, SPAB said, there would be neither rhyme nor reason in permitting the use of those same materials to erect public works, new factories, office buildings, or other structures unless it could be shown plainly that such construction is vital to the nation.

SPAB urged all Federal, State, and local government agencies to refrain from issuing permits or other authorizations for construction work on which priorities assistance would have to be denied.

It also suggested that building codes in many cities require the use of excessive amounts of critical materials, and urged that such codes be suspended during the emergency.

Total construction during 1941, SPAB found, will probably reach $11,000,000,000 —about equal to the highest levels previously reached in 1926 and 1927. This figure does not include approximately $3,000,000,000 which is being spent during the year on maintenance, repair and remodeling. About $4,900,000,000 is being spent on defense construction, as follows:

Military construction	$1,800,000,000
Industrial facilities	1,700,000,000
Defense housing	1,200,000,000
Defense highways	200,000,000

Nondefense construction for the year totals $6,300,000,000. The breakdown here is as follows:

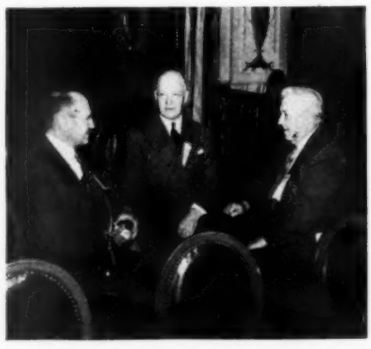
Residential construction	$1,800,000,000
Industrial construction	500,000,000
Public works	1,500,000,000
Commercial building	900,000,000
Public buildings	400,000,000
Privately financed utilities	700,000,000
Farm construction	500,000,000

The critical material chiefly used in construction work is steel.

SPAB's studies indicate that defense construction next year will require about the same number of workers that it now uses. The amount of maintenance, remodeling and repair work during the year is expected to be roughly equal to the volume in 1941. Principal reductions in employment, therefore, will occur in the field of nondefense construction.

In that field, SPAB pointed out, growing shortages of critical materials would cause a considerable displacement of workers even if restriction of nondefense construction were not adopted.

This, of course, will affect the expansion program of the power companies and R.E.A., as well as the smaller electrical contractor who does the house wiring, and the small commercial work. But as more of these men drift over into defense work and industrial maintenance work, there will be more than enough employment and with better net earnings.



COAST-TO-COAST confab at the Eastern Section, I.A.E.I. meeting at Washington, D. C. Participants are (L to R) R. B. Shepard, Underwriters Laboratories, New York; V. H. Tousley, Chicago, International Secretary-Treasurer; G. E. Kimball, San Francisco, International President.

PHELPS RECEIVES McGRAW AWARD

Dwight G. Phelps, vice-president of Colt's Patent Fire Arms Manufacturing Company of Hartford, received the James H. McGraw Award Manufacturers Medal at a luncheon meeting during the convention of the National Electrical Manufacturers Association in New York, October 29. The presentation was made by Horace P. Liversidge, president, Philadelphia Electric Co., in behalf of the Committee of Awards. The citation reads:

MEDALIST DWIGHT G. PHELPS

"Dwight G. Phelps, vice-president of Colt's Patent Fire Arms Manufacturing Company of Hartford, heading their electrical manufactures, has long been deeply interested in both the social and economic aspects of industrial employee relations. Because of his knowledge in this field, he became chairman of the Industrial Relations Committee of the National Electrical Manufacturers Association in 1937 and organized an industry wage survey embracing the factories of many member companies, the purpose being to develop a system that would automatically prevent unfair wage treatment of individual employees. The plan ingeniously classifies the worker on a broad basis of not only proficiency but potentiality by recognizing not only production but character, attitude, intelligence, leadership, initiative, responsi-

How to Boost Wiring Capacity Without Rewiring

IMPROVE POWER-FACTOR WITH G-E PYRANOL CAPACITORS

Easy to install in out-of-the-way locations. Space-saving overhead racks could be used because Pyranol (the treating liquid in these capacitors) is noninflammable.

"With a total expenditure of less than $13,000, our savings have averaged $1,000 monthly, which is better than expected. In addition, we have had no maintenance expense." This is the profitable experience of the Murray Corporation of America, Detroit, after increasing the capacity of the plant distribution system with 1440 kva of G-E Pyranol capacitors.

You get—

1. **A 10- to 40-per cent increase in circuit capacity (depending on plant power-factor)**
2. **Savings up to 50 per cent over other mtehods**
3. **Possible savings in power cost that may pay for the capacitors in one to three years**

Does your plant use induction motors? Induction furnaces? Then the chances are that the power-factor is low—that your circuits are "clogged up" with a lot of reactive (nonworking) current. And that means that you can greatly increase the capacity of your existing wiring simply by installing G-E Pyranol capacitors on the lines. They neutralize reactive current and so permit the entire system to carry more *useful* current for additional motors and other equipment.

Equally important—if your power contract contains a power-factor-penalty or kva-demand clause, you will realize direct savings in reduced power cost that may *pay for the capacitors in from one to three years*. And the savings continue as a highly profitable return on the investment.

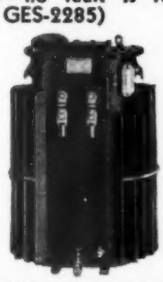
Ask your G-E representative for a quick estimate of the increase in capacity and the savings possible with Pyranol capacitors. Popular ratings are carried in stock for prompt delivery. We ship directly from the warehouse shelf.

Write for Bulletin GEA-77. General Electric, Schenectady, N. Y.

OTHER AIDS FOR OVER-LOADED SYSTEMS

AIR-COOLED INDUCTION REGULATORS

Over-loaded circuits mean low voltage and inefficient operation of motors and lamps. G-E air-cooled induction voltage regulators will bring performance back to standard. And indoor installations are easy to make—no vault is required. (Bulletin GES-2285)



PYRANOL TRANSFORMERS

An easy way to provide for new loads. Install them indoors at *load centers* to get power right where you want it. No vaults required. Close-to-the-load installations save secondary copper, give better voltage, and reduce losses. (Bulletin GEA-2048B)

AIR-COOLED TRANSFORMERS

Like Pyranol transformers, these units can be installed indoors to obtain greater capacity plus savings in both time and materials. Particularly adapted to circuits 600 volts and below. (Bulletin GEA-897H)

GENERAL ELECTRIC

407-22-5700

bility and other qualities that make a man what he is and what he is worth. This system uncovers the forgotten man in factories, and stimulates the progress of the individual as well as rewards the worker for this actual accomplishment.

"With this accumulation of experience and data to guide him, Mr. Phelps became chairman of the special Walsh-Healy Committee appointed by NEMA to cooperate with the Federal Government in establishing a minimum wage rate for the electrical manufacturing industry under the Walsh-Healy law. He prepared an analysis and evaluation of wage practice and conditions within the electrical manufacturing industry that offered a sound and sympathetic basis of approach and contributed richly to the knowledge of both the government and of industry. Out of these very practical resources of information, discussions and hearings have been conducted in Washington with complete harmony, cooperation and mutual respect. And they will doubtlessly lead to conclusions that are constructive and sound, because they are based on understood facts. It has been a fine example of the highest type of relationship between government and industry where a frank and temperate exchange of views prevails.

"In recognition of this distinguished contribution to the advancement of the manufacturing branch of the electrical industry, the judges have awarded to Mr. Phelps the Manufacturers Medal and Purse for 1941, given under the James H. McGraw Award."

The judges who selected Mr. Phelps for the award were—E. P. Allis, vice-president, Louis Allis Company, Milwaukee; Sears B. Condit, president, Chase-Shawmut Company, Newburyport; F. R. Fishback, president, Electric Controller & Mfg. Co., Cleveland and George A. Hughes, chairman, Edison General Electric Appliance Co., Chicago.

EASTERN INSPECTORS SUPPORT DEFENSE

Electrical inspectors of the eastern coast gathered at the Nation's Capital to hold the 17th Annual Meeting of the Eastern Section of the International Association of Electrical Inspectors, Sept. 22-24. The convention program was centered around the theme "National Defense and How the Association Can Best Promote It."

In supporting this theme the convention approved a resolution recommending—"... firm adherence to the National Electrical Code as the minimum safety standard and the electrical standards of the Underwriters Laboratories ... but, where, for specific reasons it appears necessary to waive or reduce, for a temporary period, some particular minimum standard ... the authority should make every effort to relax mandatory compliance ... only to the least practicable extent ... only as a permissive alternate without abrogating said standard ... and only for the duration of the special emergency."

The major portion of the three-day session was devoted to open forum discussions of specific code articles, supplemented by the usual early-morning code chats.

Heading the list of speakers were J. D. Lynett, president, eastern section and G. E. Kimball, international president, both of whom stressed the importance of the electrical inspector in the National Defense Emergency. Recent Interpretations of the N.E.C. were presented by V. H. Tousley, N.F.P.A. W. E. Armstrong, Underwriters Laboratories, Inc., outlined the operation of the Laboratories and discussed inspector contacts in the field. F. B. Silsbee, National Bureau of Standards presented a highly educational talk on the generation and hazards of static electricity. The application of high voltage fluorescent lighting was covered in an illustrated talk by M. M. Brandon, Underwriters Laboratories.

An interesting paper on State Legislation, covering contractor licensing and inspection, was presented by G. A. Sawin, NEMA. Paul Ferneding, New York Board of Fire Underwriters, told of the Code problems encountered in the use of motors and controls on machine tools. Fire protection in National Defense was outlined by R. S. Moulton, N.F.P.A. J. A. Dickenson, National Bureau of Standards, explained the work of the Bureau in his talk on Safety to Life, while Arthur Abbott, NEMA, discussed the Progressive Serviceability of the National Electrical Code.

At the business session on the last day the following officers were re-elected: J. D. Lynett, New York, president; T. V. Ward, Washington, D. C., 1st vice-president; R. W. Eaton, Providence, 2nd vice-president; A. W. Hopkins, Springfield, Mass., treasurer, and F. N. M. Squires, New York, secretary. Executive Committee members include the officers and C. A. Berlepsch, W. J. Canada, J. C. Forsyth, Joseph Hagendorn, W. J. Mahan, R. B. Shepard. Representatives to the Executive Council are Paul Ferneding, J. C. Forsyth, R. B. Shepard, J. D. Lynett, W. J. Mahan, F. N. M. Squires, T. V. Ward and R. B. Ward. Electrical Committee Representatives are W. J. Mahan and F. N. M. Squires, members; R. W. Eaton and T. V. Ward, alternates. Boston is the next convention city.

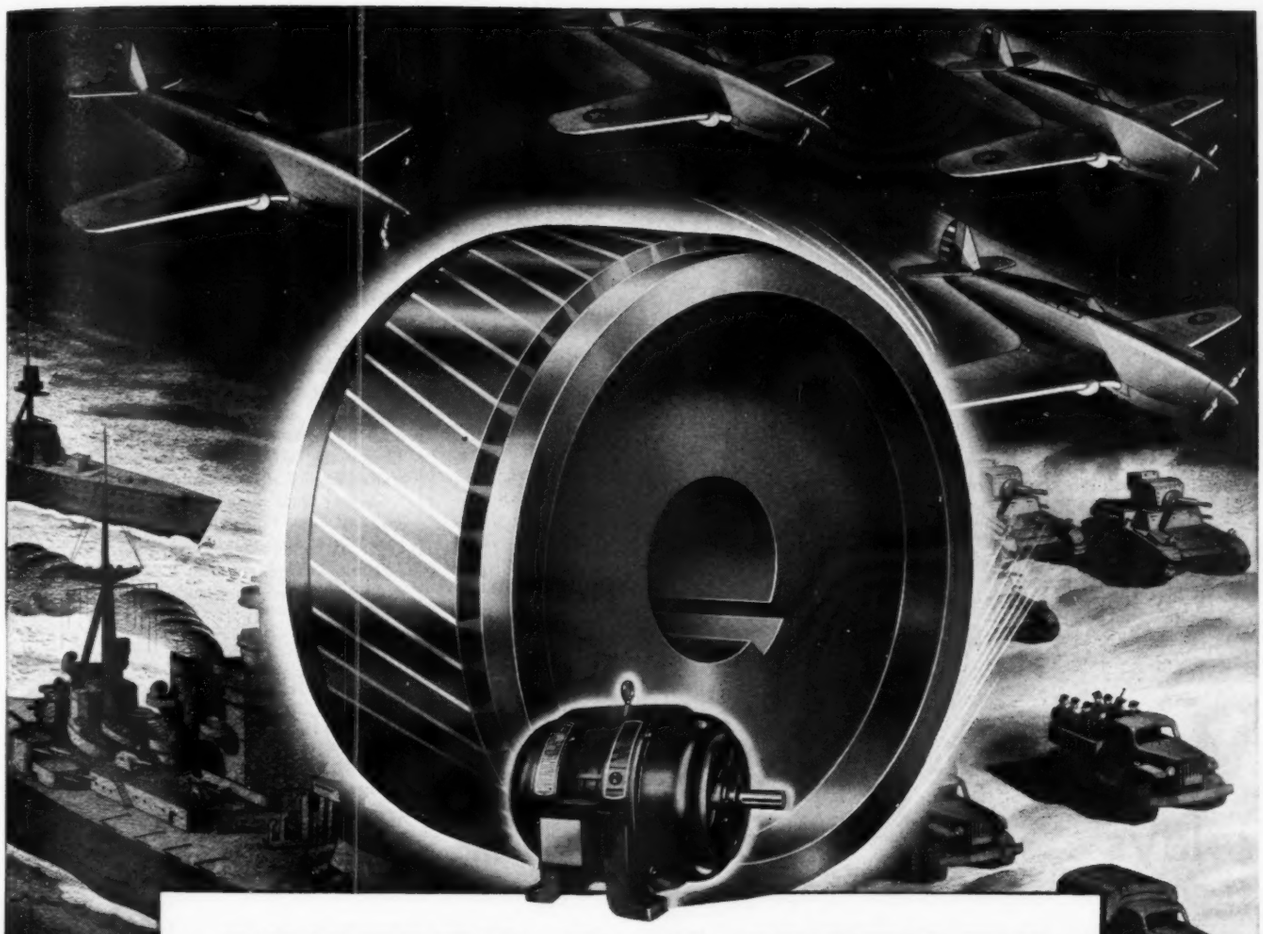
Between sessions the delegates inspected the exhibit booths of more than 20 manufacturers. The entertainment program included a night inspection trip to the Washington National Airport and the annual dinner dance. Special entertainment kept the ladies occupied throughout the convention.

COPPER SCRAP CONTROL

With copper ranking next to aluminum as the most difficult of the critical metals to obtain in sufficient quantities for defense needs and civilian uses, copper scrap today has been placed under full priority control in an order signed by Donald M. Nelson, Director of Priorities. One section of the order deals with brass mills, either directly, or through dealers, who are not permitted to make deliveries to any melter other than a brass mill. The effect of this provision is to channel brass mill scrap back to those melters where it can most efficiently be converted into usable forms of brass.

Copper and copper base alloy scrap (other than brass mill scrap) may be delivered only to dealers, or in cases where a preference rating of A-10 or higher has been assigned to deliveries. No copper or brass mill scrap may be delivered under existing or future conversion, or toll

"That's only your father, dear, repairing a break in the lamp cord."



SPECIFY F-M MOTORS

with the Copperspun Rotor

for "ALL OUT" Production

There's no motor so capable of standing up to today's production tempo . . . of operating dependably under the most severe plugging and reversing service . . . as the Fairbanks-Morse Motor with one-piece rotor winding centrifugally cast of SOLID COPPER.

That's because copper has better electrical, thermal, and mechanical characteristics for motors than any other metal of which rotors are cast. You get the unique benefits of cast copper rotors in F-M Motors without extra cost . . . only F-M has succeeded in producing the *Copperspun* rotor.

Get the complete story of what F-M Motors with the patented features of Copperspun rotors can do for you in speeding production, reducing operating costs, and giving added years of trouble-free service. Write Fairbanks, Morse & Co., Dept. K-25, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

Copperspun
Patented

FAIRBANKS·MORSE MOTORS

DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

THE GOVERNMENT COMES FIRST

Ward Leonard is under National Defense production. The goods we make are not used by themselves but become component parts of other equipment that may not be finished for many months. It is vital, therefore, that we give the government earliest possible deliveries.

There is room in our shop from time to time, however, for non-conflicting requirements which we wish to make available to our old friends. Yes, we want your inquiries . . . we will give them our best attention possible.

WARD LEONARD ELECTRIC COMPANY
28 SOUTH STREET MOUNT VERNON, N. Y.

WARD LEONARD
relays . . resistors . . rheostats
ELECTRIC CONTROL DEVICES SINCE 1892

OAMCO REFLECTORS

FIXTURES GET CUSTOMERS' O. K.!

RLM STANDARD Two 40
or Two 100
WATT LAMPS

—whether they are

FLUORESCENTS or INCANDESCENTS . . .

Customers have no hesitancy in giving their O. K. to OAMCO finished jobs because they give them high lighting efficiency with minimum installation and maintenance costs. The demand today is for the most practical type of lighting and whether incandescents or fluorescents best fill the bill OAMCO fixtures are the contractors' choice. The line is complete as to size and type. Send for complete catalogs.

OVERBAGH & AYRES MFG. CO.
411 S. CLINTON ST. CHICAGO, ILL.

RLM
STANDARD DOME

In the News

[FROM PAGE 112]

agreements, unless these agreements have been approved by the Director of Priorities.

The order prohibits the melting of any scrap by dealers, including that which they may have on hand, without specific authorization from the Director of Priorities. A dealer is likewise prohibited from accepting scrap, unless he has turned over his inventory within the preceding sixty days, and has filed the required reports with the Office of Production Management. These restrictions are designed to make hoarding by dealers unlawful.

Copper has been under rigid allocation control since the issuance on August 2, 1941, of General Preference Order M-9-a. The new supplementary order completes the control of this basic scarce material.

N. J. CONTRACTORS SUPPORT LICENSING

Representatives of electrical contractors throughout the state of New Jersey gathered to discuss state licensing at the ninth annual convention of the New Jersey Council of Electrical Leagues, Hotel Claridge, Atlantic City, October 10-11.

At a pre-convention meeting, for contractors only, an open forum discussion was held on Assembly Bill No. 561 (State License Bill for Electrical Contractors) which now rests in the State Legislature. Partial dissension and opposition by some contractors based on a general misunderstanding of the content and intent of the

OPENING GUN in a campaign for better fluorescent lighting jobs handled through regular trade channels in the North Central area asks store owners to buy from their electrical contractor. A. H. Kessler of the North Central Associated Electrical Industries reads the first proof of an ad, backed by every branch of the industry, which will reach 40,000 business men.

PERTINENT PROBLEMS on inspection, priorities, R.E.A., and contracting were discussed by (L to R) J. R. Early, City Electrical Inspector, Roanoke, Va.; A. M. Blakeney, Head of Wiring Unit, Application and Loans Division, R.E.A.; and M. W. Scarborough, Field Representative, Virginia Electrical Contractors Assn. Huddle took place between sessions at the Eastern Section, I.A.E.I. meeting in Washington.

bill, was overcome when suggested amendments were studied and incorporated into a revised version of the act. These revisions now await introduction into the Assembly when it reconvenes this month.

At the general convention session, attended by more than 160 representatives of the electrical industry, W. A. Shaw reported on the activities of his Licensing Committee. A. E. Schanuel, field representative of the National Adequate Wiring Bureau told of the importance of the electrical installation in home building. "There's No Blackout in the Lighting Industry," was the subject of a talk presented by H. H. Green, G. E. Lamp Department, Nela Park. Burr Martin, publisher, *Electrified Industry*, Chicago, gave an interesting illustrated presentation of electrical applications in defense industries. In discussing residential wiring, O. K. Coleman, American Gas and Electrical Service Corp., recommended that provisions be made now for the installation of ranges and other appliances after the defense emergency is over. Samuel Rosch, Anaconda Wire and Cable Co., presented an illustrated and highly interesting lecture on the behind-the-scenes activities of research chemists in their quest for more and better synthetic materials.

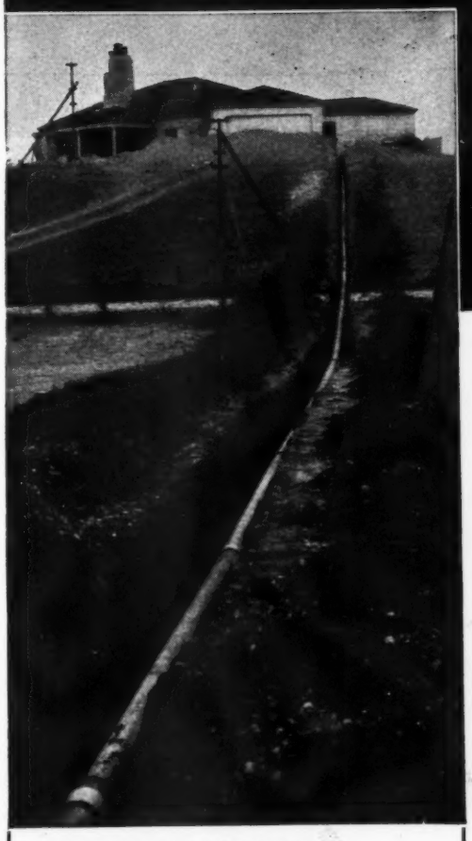
The convention activities ended with the annual dinner-dance of the association.

CONTRACTORS EXCHANGE MATERIALS

The quarterly meeting of the Virginia Electrical Contractors Association, Inc., at Lynchburg, was devoted to a discussion and drafting of legislative bills for state electrical contractor licensing and electrical inspection; also a forum on ways and means of assisting the National Defense Program.

The Association's tentative plans call for a combination contractor licensing and electrical inspection bill which will be presented to the Virginia Legislature this coming January. All members present favored state legislation to this end and voted financial support of the measure.

FINISH CONDUIT JOBS FASTER - use J-M TRANSITE DUCTS



YOU SAVE MONEY on both material costs and installation expense when you use Transite Conduit. No concrete encasement is needed underground, for this durable duct is highly resistant to soil corrosion . . . has ample strength to withstand earth loads. And because of the simple assembly method, lines are laid easily and rapidly.

You can't miss saving time and money with J-M Transite Ducts. These durable ducts are so light in weight that handling is simple and easy. Crews can assemble Transite Ducts faster, for Harrington Couplings eliminate screwing or threading operations. Joints go together quickly . . . drive up tight. Transite's smooth bore provides fast, easy cable pulls.

And no preservative treatments are needed, because Transite Ducts are made of asbestos and cement. They can't burn or rot . . . effectively resist weather and corrosion . . . keep maintenance low.

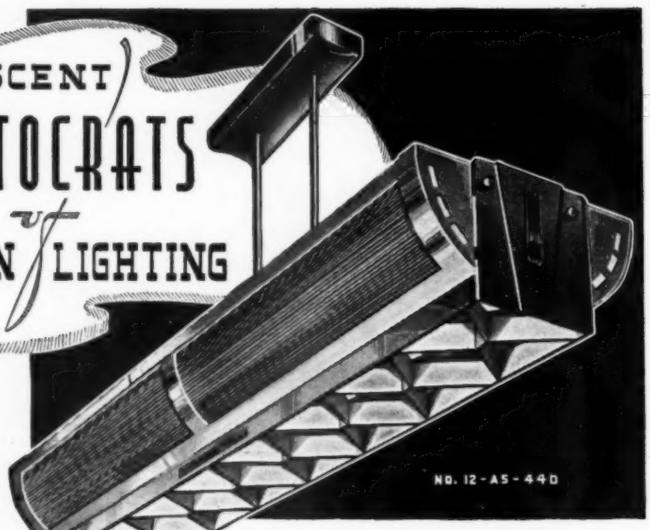
For complete information, ask for brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville
TRANSITE DUCTS

TRANSITE CONDUIT . . . for exposed work and for installation underground without concrete encasement.

TRANSITE KORDUCT . . . for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.

FLUORESCENT
ARISTOCRATS
of
MODERN LIGHTING



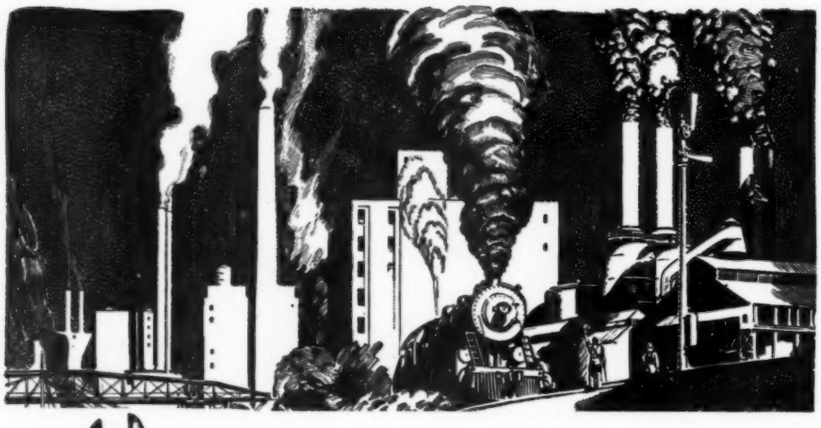
GLASS SHIELDED-METAL LOUVRED . . .

This high quality fluorescent luminaires combines original design with the foremost engineering principles in fluorescent. Louvres and pentecor glass shields give you higher levels of indoor daylight without glare or extreme surface brightness. The compelling and aristocratic appearance insure the right decorative fixture for any interior architecture. Fixture is available for 2—48″ 40 watt, 2—60″ 100 watt or 4—48″ 40 watt lamps.
Write today for information about our complete new line of fluorescent luminaires. Designed and Fabricated by one of the first and leading fluorescent manufacturers.

IF IT'S FLUORESCENT, IT'S . . . . . .

LIGHTING PRODUCTS INC.
Highland Park Illinois, U. S. A.

DOUBLE-BARRELLED PREPAREDNESS
for "Defense" and Non-Defense Industries



IF America is to be prepared, then each supplier must be prepared to serve and *serve well*. SUPERIOR is prepared. Geared to give service—uniformity of brush quality guaranteed—for defense and non-defense industries. Whether it be a carbon specialty made-to-order, or carbon, graphite, or metal-graphite brushes for the fractional hp motor or the heavy-duty generator, we are mustered for forward-marching service. Command us! Engineering Dept. fully staffed.

"ALL THAT THE NAME IMPLIES"

SUPERIOR

CARBON PRODUCTS, INC.
9115 George Ave. Cleveland, O.
BALANCED QUALIFICATIONS

In the News

[FROM PAGE 115]

The "ways and means" discussion on helping in the National Defense culminated in the formation of a tentative "lend-lease" program of swapping materials between contractors. The plan, according to Marion W. Scarborough, the Association field representative, centers about contractor inventories. Each contractor is to take his own inventory and give a copy of it to the field representative, who will keep it on file and use it to expedite defense job construction.

A contractor experiencing material delivery delays on defense jobs can borrow such material from contractors whose inventory shows a stock of it. When the delayed material is delivered the borrower returns it to the lending contractor. A system of fair compensation for material not returned is a part of the plan. The whole system is somewhat of an experiment—the contractor's contribution to help expedite defense plant construction.

GROUNDING PORTABLE DRILLS

A commercial standard on portable electric drills has been announced by the United States Department of Commerce. It was initiated by the Electric Tool Institute as an industry program to establish a better base for certification of capacity and performance.

The requirements for cord and attachment is of particular interest, because of the long discussion of the hazards involved in improper grounding. This section provides that—Each drill shall be equipped with a minimum of 10 feet of approved type S or SJ flexible rubber-covered, three-wire cord, extending beyond the tool with a suitable two-prong attachment plug of an approved type. Metal frames of the drills and the switch shall be effectively

STEVE TELLS ONE. S. J. O'Brien, New York (left) has just finished telling one of his stories to this after-session group at Saranac Inn. The interested audience is composed of (L to R) Louis Kennedy, Hugh Morgan, William Berken and Anthony Angelo.

grounded. Ground connections to the frame shall be made inside the frame and well protected against mechanical injury. Such ground connections shall be a separate connection screw which shall not be used for any other purpose, with a lock washer between the screw head and the wire. The green-colored insulated wire shall be used as the ground wire and available for ground connection at the attachment plug. This wire should be suitably tagged with instructions for making proper ground connection. The cord of the portable equipment shall be provided with a strain relief and an antikink device at the junction of the cord with the tool. The size of the conductors shall be determined from the full-load ampere rating of the tool, and shall be in conformance with the table of the allowable carrying capacity of flexible rubber-covered cord as given in the National Electrical Code.

MULTIPLIED No. 8 small diameter RU wires solved a tough little feeder problem for E. A. Davis of General Engineering and Sales Company of Hammond, Ind. A 150-foot run of 1¼ buried in a concrete slab was the only route for serving a heavy beauty shop appliance load. The old conductors, 3 No. 6's, were removed and a group of No. 8's, 3-in. multiple on each outside and the neutral were drawn in providing approximately double the capacity of the original circuit.

NEW MEMBERS ON A. W. EXECUTIVE COMMITTEE

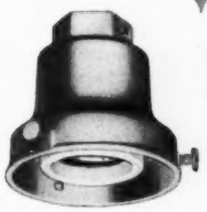
The National Adequate Wiring Bureau has announced the appointment of three new members to the Executive Committee. They are H. E. Dexter, vice-president, Central Hudson Gas & Electric Corp.; W. E. Parrott, general commercial manager, Ebasco Services, Inc., representing utilities; and A. C. Prange, General Electric Supply Corp., representing wholesalers.

Mr. Parrott is taking the place of R. H. Fite, Jr., and Mr. Prange that of John L. Busey.

GENERAL ELECTRIC
Wiring Devices for Industry

A FEW OF THE MANY DEVICES AVAILABLE

GE1166 socket, one-piece body—for Mogul base lamps



GE3329 weatherproof socket—for damp locations

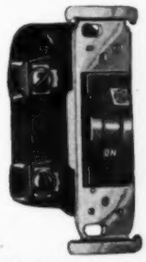
GE2703 Textolite socket—strong where strain comes

GE2971 heavy-duty switch, 20 amp. type

GE2777 four-pole outlet and GE2775 cap, 20 amps., 250 volts

GE2999 triple-pole switch—1 hp., 550-volt, A.C.

GE3094 three-wire connector body and GE3080 cap



G-E branch-circuit circuit breaker—15, 20-, 25 amp. capacity

GE857 ceiling switch for lighting

GE2268 and GE3239 cable terminals

Silvend fuse—helps reduce fuse overheating

You'll find the heavy-duty wiring devices you need for industrial wiring in the G-E line—sockets, switches, outlets, connectors, extenders, fuses, etc. The quality of these devices is uniformly high. They give lasting, dependable service. G-E distributors are located at key points all over the country to care for your individual needs.

For further information see the nearest G-E Merchandise Distributor or write to Section D-18A, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

FULL SPEED AHEAD
with
IDEAL MONEY SAVERS
. . . MEET CONTRACT DATES
. . . AVOID TROUBLE-SHOOTING

IDEAL "WIRE-NUTS"

Solderless, tapeless wire connectors that take the work out of making wire joints. Strip wires—screw on—that's all! Fully approved, listed by Underwriters' Laboratories, Inc.

Prompt shipment—no parts on critical list

IDEAL WIRE and CABLE REEL

Essential to prevent time wasting snarls and knots in handling of coils, wire, cable, Romex, etc. Hang singly or in tandem from pipe, joist or beam. Inexpensive.

IDEAL FISH TAPE REEL and PULLER

Save expensive tape breakage and keep tape under control at all times. Three tools in one: Tape — reel — puller. Tape runs out easily and quickly.

IDEAL BX ARMOR CUTTER

No wasted BX with this pocket-size tool! Simple to use as cutting paper. Supplied with hardened steel cutting blade that is easily removed for sharpening.

"SNAP TITE" IDEAL SWITCH BOX SUPPORTS

Holds any standard sectional switch box securely, in composition walls. No screws or special tools needed to install these time-saving switch box supports.

IDEAL JOIST BORING MACHINE

No ladders — no stoop—no stretch—no cramped working position with this Joist Boring Machine. Chain operated. Bores holes anywhere from below sills to eleven feet above floor. Weighs only 11 pounds.

MORE TIME SAVERS BY IDEAL

Investigate now!
Write for IDEAL Free Catalog!

IDEAL COMMUTATOR DRESSER CO.
1041 PARK AVENUE SYCAMORE, ILLINOIS
"Sales Offices in All Principal Cities"

In the News

[FROM PAGE 117]

COMSTOCK GETS OPM POST

Louis K. Comstock, electrical contractor and engineer of New York City has been named, by the Office of Production Management, as chairman of the board of review set up under the building trades defense stabilization agreement.

Mr. Comstock has long been active in the conciliation of labor disputes. He has been chairman of the Council of Industrial Relations for the Electrical Construction Industry for over 20 years and is one of the organizers and a director of the American Arbitration Association. He is also a director of the Commerce and Industry Association of New York.

The effort to minimize the number of labor disputes in the building trades, is regarded by Mr. Comstock as an experiment which might point the way to the elimination of strikes not only during the war but afterward.

MARYLAND CONTRACTORS DEFENSE COMMITTEE

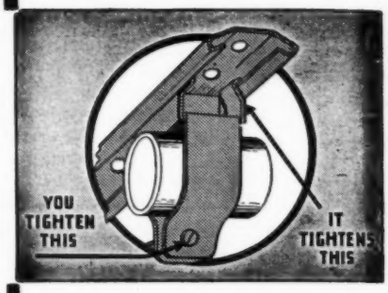
Realizing the importance of the electrical contractor in the National Defense picture, the Electrical Contractors Association of Maryland recently appointed a Defense Committee. This group will collaborate with the Maryland Council of Defense and the Civil Protection Committee of the Maryland Section of the American Institute of Electrical Engineers, in the problems of repairs to essential services in the event of an emergency.

Those on the Contractors Committee are Arthur S. Raffel, chairman; Samuel Lipman and Edward D. Prince.

BACK HOME AGAIN after a six months stay on an electrical construction job for the H. P. Foley Company in Puerto Rico. Elmer Statler, field superintendent for the Foley company, Washington electrical contractors, is now in charge of the electrical work on the new Statler Hotel in the Nation's Capital.

With Only One Screw to Tighten

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

"CONVINCE YOURSELF"
"Send for Circular Giving Full Details"

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

LINKED WITH-

QUALITY *Moderate Price* SIGNAL

When you buy Signal Products you know they are good value for the price. Quality and Moderate prices have made Signal a leader in the fan and ventilator field.

SIGNAL ELECTRIC MFG. CO.
MENOMINEE, MICHIGAN
Offices in Principal Cities

SIGNAL

MULTI

FLUORESCENT FIXTURES ASSURE GOOD LIGHTING OVER LONGEST PERIODS...

"IDEALITE" meets the demand for a serviceable fluorescent unit low in first cost. Very efficient—easy to clean. Knock-outs in back of wiring trough and each end for chain loops or stem suspension.

"FLUORAINE" provides ideal single-unit light intensity for close work, in shops, storerooms, offices, etc. Can be mounted low because of cool operation—no reflected glare. Easily cleaned. Furnished unwired with equipment mounted in place.

Send for Complete Catalog

MULTI

ELECTRICAL MANUFACTURING CO.

1840 W. 14th ST., CHICAGO, ILL.

DEALERS-Sell TORK CLOCKS

TURN ANYTHING ELECTRICAL ON AND OFF REGULARLY

Four Little Giant Models

Self-Starting

Ratchet Setting Dial; One Minute Accuracy; Hinged Cover; Lots of Room; 12 Knock-outs; 1 R.P.M. Indicator

191 A	—Single Pole, 20 Amp.	$13.00
1191	—Single Pole, 35 Amp.	14.00
962 A	—Double Pole, 20 A. ea.	15.00
1962	—Double Pole, 35 A. ea.	16.00
Apt. House, 2-S.P. Circuits		25.00

Sixty Minute and Four Hour Timers

DEALERS PROFIT
Single 30%
2 or more.....35%

CARRIED BY JOBBERS EVERYWHERE

The Tork Clock Co. Inc.

MOUNT VERNON, NEW YORK

INFRA-RED drying and baking is "hot stuff" for the industrial service shop, says Roy Hyre, Hyre Electric Company of Chicago. The unit shown is used for paint drying on flat surfaces and may be adjusted to any angle. Portable heat tunnel equipment has been built up for demonstration use on conveyor lines. This prominent Chicago shop has recently taken over new quarters, 16,500 square feet of floor space with all shop facilities on the ground floor and modern fluorescent lighting.

A.W. CONFERENCES ON DEFENSE HOUSING

A series of five district conferences of the electrical industry, sponsored by the Electrical Association of Kansas City and the National Adequate Wiring Bureau, were held beginning October 14 in Kansas City, Columbus, Atlanta, Chattanooga and Dallas.

Representatives of the industry responsible for planning, construction and private financing of defense housing projects discussed all phases of defense housing with specific reference to the adequate wiring problem.

A. E. Schanuel, field representative of the National Adequate Wiring Bureau worked with the arrangements committees and served as discussion leader at all of the district conferences.

RE-WIRING PROMOTION STARTS

A 50-page pocket size handbook on "Rewiring for Commercial and Industrial Buildings" starts the work of the Re-Wiring Committee of Edison Electric Institute on its promised program of promotion.

It is designed to serve both as a manual and reference for utility men, architects, contractors, inspectors and others. The booklet covers the use of the new small diameter wire for rewiring of office and factory buildings, in order to increase capacity of the electrical system without the expense of replacing existing raceways, rebuilding and redecorating. It suggests how the utilities may best promote small diameter wire.

The various types of small diameter wire now available and the characteristics of each are described, with the possibilities for the use listed. Diagrams of typical distribution systems, feeder and branch circuits in buildings are shown, with the ad-

Improved *for greater usefulness*

Watertight Socket fits snugly on side of lamp.
Concave Wire Outlet with pliable rubber opening that grips wires tightly and effectively seals end of handle.

New Features for Popular 7000 Guard Series

Guards in every sense of the word . . . the new McGILL 7000 Series protects not only light bulb but all connections to it.

Note in the illustration above the Watertight rubber socket and the rubber seal in the handle end . . . both of which prevent seepage of water and moisture to the interior. Connections, light bulbs, users . . . all THREE are protected by this new McGILL construction, every detail of which passes the rigid requirements of Underwriters' Laboratories. This guard can also be furnished with McGILL composition socket if desired.

There's a size and type for every need . . . in industrial plants, garages, railroad work, etc. Write for complete details.

Defense Projects Use McGILL Products

McGILL MANUFACTURING CO.
Valparaiso, Indiana
Electrical Division

McGILL

FLOOR BOXES and WIRING SPECIALTIES by Latrobe

You can satisfactorily handle residential, commercial or industrial requirements with products from the Latrobe line . . . it's complete in every detail. Too, the entire line is designed to save installation time . . . a point well worth considering in the selection of floor boxes and wiring specialties.

NO. 150 BOX WITH NO. 207 NOZZLE

An Underwriters' Approved box, suitable for installation in concrete floors or in wood finished concrete floors. Quickly and easily installed. Tops of boxes are easily adjusted.

NO. 285 DOUBLE DUPLEX RECEPTACLE NOZZLE

An attractive unit, easy to install. Shown here with No. 200 Cover Plate.

Write for details TODAY!

NO. 130 ADJUSTABLE WATER TIGHT FLOOR BOX

No. 130 Box with No. 207 Bell Nozzle. Cutaway view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Cover plate 3½" —overall height 3½".

FULLMAN MFG. COMPANY
LATROBE • • • • PENNSYLVANIA

How to wire for light and power

JUST OUT—2nd EDITION OF RICHTER'S

PRACTICAL ELECTRICAL WIRING

500 pages, illustrated, $3.00

IN ACCORDANCE WITH THE 1940 CODE

Here is a complete course of instruction for those who want to learn how to do electrical wiring. Begins with very first elements and takes the reader by easy steps, plain instructions and methods, to the completion of typical wiring jobs in accordance with official requirements of the 1940 National Electrical Code. Employs simple language; confines mathematics and theory to the minimum necessary for understanding of the work; covers medium voltage jobs of the types that are most in demand.

3 parts cover residential, farm and industrial wiring

1. Underwriters and codes; electrical principles and measurements; basic devices and circuits; wire, sizes and selection; connections and joints; residential and farm motors; etc.

2. Planning an installation; specific outlets; switches and other devices; old work; farm wiring; isolated lighting plants; wiring apartment houses, etc.

3. Planning non-residential installations; non-residential lighting; miscellaneous problems; wiring for motors; wiring schools, offices, stores, and churches, etc.

MAIL THIS COUPON FOR 10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Richter's Practical Electrical Wiring for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

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Position .....

Company .....E.C. 11-41

(Books sent on approval in U. S. and Canada only.)

In the News

[FROM PAGE 119]

vantages of each analyzed. Uninsulated neutral conductors, calculations of voltage drop and conductors in multiple for large capacity are described and valuable tabular data is organized in 13 tables.

EEI plans to put men in the field to work with local power companies in promoting local interest in rewiring and helping to organize action by all branches of the local industry. As an aid to demonstration, a kit has been prepared that contains samples of conduit and 18 sample combinations of small diameter wire. With this equipment it is easy to show how the capacity of existing conduits can sometimes be doubled and tripled. Dramatic Kodachrome lantern slides have also been prepared to tell the story of commercial rewiring and home wiring.

APPLETON LEAGUE WILL CERTIFY WIRING

The Appleton (Wis.) Electric League has recently been licensed by the National Adequate Wiring Bureau to certify A.W. installations in homes within the city of Appleton. This group is the fifty-second organized to undertake the certification phase of the National Adequate Wiring Program.

W. B. Kennedy, of the Wisconsin Michigan Power Company, is chairman of the League's Adequate Wiring Committee. Other members are: Louis Luebke, electrical inspector, City of Appleton; A. A. Schneider, The Langstadt Electric Company; Earl Evans, General Electric Supply Corporation; and Ted Lang, electrical contractor.

DUNSMUIR HEADS VANCOUVER ASSOCIATION

Earl Dunsmuir, president of Dunsmuir Electric, electrical contractors of Vancouver, B. C., was elected to a second term as president of the Vancouver Electrical Association. J. D. Carmichael is vice-president; J. S. Homersham, secretary and R. Sutherland, treasurer.

The Executive Board is composed of B. Graham, Graham Electric; R. Beaumont, Beaumont Electric & Radio; C. Longley, Longley Electric Co., Ltd.; J. A. Holt; E. Crosby, Crosby Electric Co.; R. Hall, Electrical Service League and T. Barwood of Ideal Electric.

HOUSING TOTALS CLIMB

Charles F. Palmer, Coordinator of Defense Housing, has announced that 1,782 new publicly financed homes for families of defense workers and enlisted personnel

ANY
DOMESTIC
REFRIGERATOR
Can Be Made
AUTOMATICALLY
DEFROSTING
with the
ADJUSTABLE
"AUTOMATIC"
MODEL 110
"Plug-In" Type—No Installation
TIME SWITCH
LISTING AT
Only $11.50
Cuts Refrigeration Costs
Improves Refrigeration
Efficiency
Write for Information
AUTOMATIC
Electric Manufacturing Co.
MANKATO • MINNESOTA

were completed during the week ending September 20, making a total of 36,560 now ready for occupancy. With 1,945 homes going into construction during the week, the total of publicly financed homes now being built or completed reached 90,498. Federal funds have already been allotted for 118,935 defense homes.

FHA-inspected privately financed homes started during the week, totaled 982. Since January 1941, 161,429 such homes have gone into construction. The total number of dormitory units for occupancy by single defense workers has reached 5,206.

CHICAGO FIGURES SHOW WIRING AHEAD OF '40

A recapitulation of data provided in electrical permit applications shows a gain of 55 percent over 1940 in outlets installed in Chicago during comparable months of 1941 according to the Electric Association of Chicago.

The upturn in number of outlets installed is indicated by the following monthly totals:

Convenience outlets:

	1940	*1941*	*Per cent Increase*
June	7,374	11,587	61
July	7,999	12,579	57
Additional outlets:			
June	2,541	4,110	62
July	2,950	3,840	30

As the totals are drawn from all types of construction they are interpreted as a reasonably accurate index of wiring activity in the area.

ELECTRICAL EXPOSITION FEATURES A.W. HOME

An all-electric adequately wired home was one of the feature attractions at the National Electrical Exposition recently held at St. Louis. The home was open for public inspection during the exposition and given away free to one of the fortunate visitors.

The A.W. certificate was presented to James Morrell, business agent, and Frank Jacobs, president of Local No. 1, I.B.E.W., who conceived the idea as a promotion plan for all-electric homes. The home is located in the St. Louis Hills Addition, a recent development of the Cyrus Crane Willmore Organization, Inc., real estate operators.

MASS. BOARD RULES ON FIXTURES

The Massachusetts State Board of Examiners of Electricians recently took a forward step toward the outlawing of substandard fluorescent fixtures. Following numerous protests from dissatisfied customers who hired electricians to install what they believed to be properly con-

Easy—To Install—
Utterly Dependable

Type G F 2 — Solder or Solderless Fitting for rigid conduit.

Strap Type—Pre-formed Ground Clamp — Exclusive Rolled End.

Sherman provides a complete line of ground clamps and rigid ground fittings—all uniformly easy to install, with improvements in design that insure positive permanent contact. Write for catalog showing the complete line of Sherman electrical specialties.

H. B. Sherman Mfg. Co.
Battle Creek, Michigan

Sherman Ground Fittings

THE MAN WE CAN'T DO BUSINESS WITH

What do I care about "Engineered Lighting"? I say THE CHEAPER THE BETTER, JUST SO LONG AS IT'S FLUORESCENT

Some men are still buying Fluorescent equipment on *price alone*. But day by day they become fewer and fewer. As time passes and experiences with Fluorescent accumulate, it becomes increasingly evident to all intelligent purchasers that the *real bargain* in Fluorescent lighting is the BEST ENGINEERED JOB.

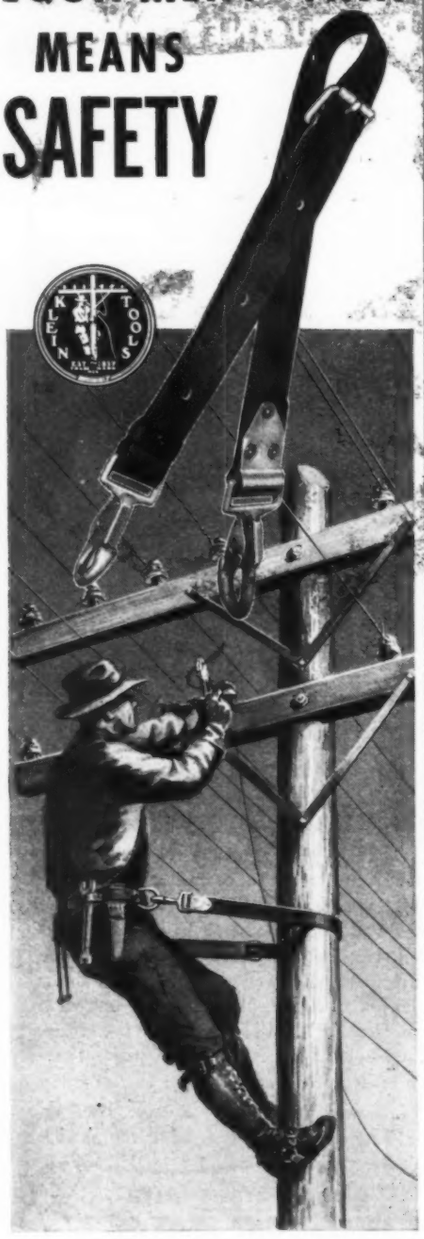
That is why so many of the leading names in American commerce and industry have selected Barkon-Frink LINOLITE as the *ultimate* in Fluorescent lighting. Not only does every LINOLITE fixture meet or exceed the quality standards set for Certified Fleur-O-Liers, but each complete LINOLITE installation is *Custom-Engineered for Performance* and *Guaranteed for Satisfaction* at no extra cost.

The soundest, money-saving advice on Fluorescent is—"Do it *right* or *not at all*."

DO IT RIGHT WITH
L-I-N-O-L-I-T-E
Send for this brochure today

THE FRINK CORPORATION
Bridge Plaza South, Long Island City, N. Y. EC-11
Please send me your new brochure on "The Ultimate in Fluorescent Lighting."
NAME .....
ADDRESS .....
CITY .....

EQUIPMENT THAT MEANS SAFETY



WHEN your life depends on a strap no wider than your three fingers, it's important that every inch of it is the finest human skill can make. The painstaking care that enters into the manufacture of Klein-Kord Safety Straps—the rigid inspection that each one is subjected to—is your assurance that when you throw your weight back, your strap will hold you fast.

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

Mathias KLEIN & Sons

3200 Belmont Avenue, Chicago, Illinois

In the News

[FROM PAGE 121]

structed fixtures, the Board made a regulation whereby the electrician who makes the installation will be held wholly responsible for the type of fixture installed. He will be required to make any reasonable adjustment should the fixture prove unsatisfactory because of substandard or faulty construction.

Although the Board has no authority to help defrauded customers in obtaining legal or monetary redress, it can revoke or suspend the licenses of electricians who continue to install units which they believe are not as represented.

FINANCING HOME REWIRING

The Kansas City Power & Light Company has made available to residential electrical contractors a plan for financing residential rewiring. The plan covers a down payment of not less than 10 per cent, with payment on the utility's monthly bills of not less than $1.00 per month for a period not extending over 12 months. The minimum balance financed, including a six per cent carrying charge, cannot be less than $12 nor more than $60. This trial plan, requested by several electrical contractors, is launched as a cooperative service and offers a sales opportunity in the vast market of residential rewiring.

R. I. CONTRACTORS PUSH BILL

The Rhode Island Electrical Contractors Association, at a recent meeting in Providence, started an intensive campaign to secure a state licensing bill for electrical contractors.

Last year's setback, when the bill just missed going through because of an adjournment of the legislature, has not dulled the zeal of the group. A committee is now working to enlist support for the licensing legislation. Organized labor is again supporting the contractors in their action and they look forward to active cooperation of the Rhode Island Electric League which backed them last year. Harry Pierce of the New England Machine and Electric Company presided at the meeting.

MASS. CONTRACTORS STUDY STATE CODE

The Massachusetts State Association of Master Electricians, at a recent meeting, appointed a committee to study the possibilities of securing a State Code. The Association officials feel that such a regulation is needed at this time.

The members appointed to make an exhaustive study of the situation include J. L. Winn, chairman, W. H. Hughes, L. H. Barrowclough, G. Ulmer and J. J. Reddington.

COLLABORATION—Bob Scott of Scott Electric Co., Bloomfield, N. J., and Charles Patterson of Buhl & Caffrey, electrical contractors of Newark, N. J., get together on a mutual problem.

BOOK REVIEWS

Standard Handbook for Electrical Engineers

The new seventh edition of this well known handbook is a complete revision of the last edition published in 1933. It is an orderly compilation of working-tool information of electrical technology, authenticated by research and experience and designed as an encyclopedia of applicable information. There are numerous new contributors, all selected for their authoritative standing in their respective fields. Subject matter has been regrouped and includes the latest information available on the newest developments in the electrical field.

Prominent changes in the contents include an expanded power-plant electrical equipment section, embracing electrical equipment for the entire power system; new treatments on power transmission, electronics, radio, interior wiring, design for commercial and industrial buildings, illumination, prime movers, telephones and other subjects; information on air conditioning, electricity in aviation and the petroleum industry, lightning technology, high voltage generators and cyclotrons. The compilation of codes and standards has been greatly expanded to facilitate obtaining standard specifications and prescribed practices. An enlarged index simplifies topic selection.

This edition is published in a new format that proves more legible and easier to handle and file. Numerous illustrations contribute to pertinence and applicability of the subject matter. Standard Handbook for Electrical Engineers, Seventh Edition, 26 sections, 2,303 pages, 6-in. by 9-in., semi-flexible binding. Price $8.00. Published by the McGraw-Hill Book Company, 330 West 42nd Street, New York, N. Y.

Lincoln Reference Book

The Lincoln Electrical Reference is a comprehensive assembly of factual data covering the selection, design, installation and maintenance of electrical systems and equipment. It features the reproduction of the National Electrical Code at points throughout the book where the specific sections apply to the subject matter discussed. The volume is designed for use by industrial plant men, power companies, engineers, designers and electrical contractors.

The contents are divided into 26 sections and cover electrified industry; electrical fundamentals and systems; industrial wiring; switchboards; panelboards; electrical control; circuit protection;

motors and generators; power factor; industrial lighting; industrial heating equipment; electric furnaces; electric welding; industrial signal systems; transformers; storage batteries; electronic equipment; electrical measurements and instruments; electrical surveys; electroplating; miscellaneous electrical equipment and applications; inspection and maintenance of electrical equipment; protection against personal injury.

The Lincoln Electrical Reference. 1200 pages, 8½ by 11, 1200 illustrations, 326 diagrams and 315 tables. Price $15 including supplementary follow up service. Compiled by E. S. Lincoln, Fellow A.I.E.E. Published by The Electrical Modernization Bureau, 60 East 42nd Street, New York, N. Y.

Photoelectric Control

This book is a practical treatise on the operation and application of photoelectric equipment in commercial, industrial, safety and National Defense problems. It is a how-to-do-it book written in simple, non-technical language and is supplemented by numerous illustrations and diagrams.

The contents cover the use of photoelectric control in grading, sorting, counting, and measuring; food and chemical processes; illumination; printing and publishing; color; scientific devices; industrial and commercial applications; safety and misellaneous applications. Photoelectric Control. 39 pages, 8½ by 11. Paper bound. Price, 50 cents. Published by Worner Products Corporation, 1019 West Lake Street, Chicago, Illinois.

WITH THE Manufacturers

G.E. Changes

Dr. H. A. Jones has been named manager of sales of General Electric electronic tubes for non-radio applications in industry. The industrial tube division has been transferred from the Special Products Section of the Industrial Department to the Radio and Television Department.

Warren C. Hutchins has been appointed manager of sales of the Special Products Section of the Industrial Department. He succeeds Dr. Jones.

W. J. Dorworth has been made assistant district manager of the General Electric Company's Atlantic District.

Johns-Manville Appointments

John A. O'Brien was elected to the post of vice-president of Johns-Manville Sales Corporation. He will continue his duties as general sales manager of the power products and industrial department.

R. F. Orth has been appointed manager of Johns-Manville's Public Utility and Electrical Department. His headquarters are now in the New York office.

Pierce Appointments

J. F. O'Brien, president of Pierce Laboratory, Inc., New York, announces the following staff appointments:

V. A. Gwyer has been made vice-president; C. A. Norton, sales manager; H. J. Morton, sales promotion manager; J. W. Parr, comptroller and E. S. Boynton, manager of engineering. These men will be located at the plant at Summit, N. J.

A new organization known as the **Wil-Son Manufacturing Corporation** has been formed. This is a reorganization of Wilson Lighting, Inc. and is the successor to the Wilson Sales Co., Inc. and the Wilson Mfg. Co. Wesley Wilson is president of the newly organized corporation, which is located at 152–156 W. Erie St., Chicago, Ill.

Owens-Corning Fiberglas Corporation, Toledo Ohio, announces the appointment of Philip Linne as sales promotion manager. W. D. Thackeray has been named advertising manager to succeed Mr. Linne.

More Gossip

Code Analyst

Harry Claffey, chairman of the Contractor's Division of the Electric League of Indianapolis, Inc., is turning code analyst these days. Harry has the tough job of making a comprehensive study of the local electrical code which hasn't been changed since 1925. He will report his findings to the Board of Directors of the League who are bound and determined to get an up-to-date set of electrical rules for Indianapolis.

Loose-Leaf Code

The new electrical code of the District of Columbia was recently issued in loose-leaf form to permit insertion of changes and additions. The superseded sheets are then discarded. This method eliminates the odious task of leafing through the code to make corrections and insertions, and provides the user with an up-to-date copy at all times.

Contractor Group Moves

The Greater City Electrical Contractors Association, Inc., New York City, moved their offices to the second floor of the Midston House, 22 East 38th St., New York City. The change of address was effective Sept. 8. Their former quarters were at 130 Clinton St., Brooklyn, N. Y.

Hirbour Heads Hampden Contractors

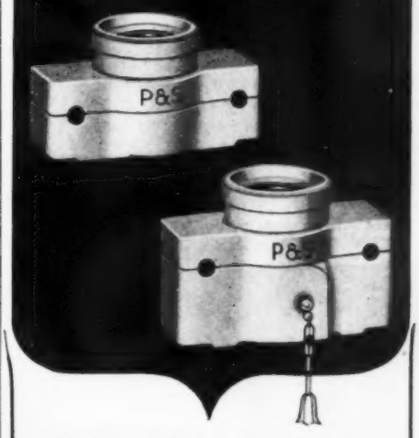
A. T. Hirbour of Springfield, Mass., was elected president of the Hampden County Master Electrical Contractors Association, an affiliate of the Massachusetts State Association of Master Electricians.

The meeting, presided over by F. E. Haskell, vice-president, was the opening gun of the association's fall activities. Plans outlined include extensive participation in educational and cooperative endeavors.

P&S

WIRING DEVICES

for NATIONAL DEFENSE



NEW . . . Pull and Keyless Porcelain Cleat Receptacles. Designed for the Defense Market.

Send for your copy of our new "Defense Catalog"—a brief summary of the P&S Wiring Device Line which provides a handy reference for selecting materials for construction, repair and maintenance under the Defense Program.

•

Sold Through Electrical Wholesalers

Pass & Seymour, Inc.
SYRACUSE, N. Y.

The MOST COMPLETE LINE OF
Service Connectors

LARGEST VARIETY of types, and a COMPLETE range of sizes. For all kinds of conductors.

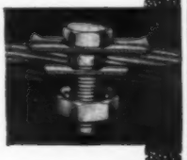
Popular connector at left is carried in stock in ALL sizes, up to 1,000,000 CM. Furnished with or without retainer.

ANY MATERIAL — Hardware Bronze, Silicon Bronze, Aluminum.

MILLIONS IN USE and never one rejection due to performance or workmanship. Can be re-used over and over.

MADE IN OUR OWN PLANT under engineering supervision. Bodies and nuts precision machine-threaded for perfect fit. No sharp edges.

ALUMINUM Connectors machined from hard drawn rod, with forged spacers.



SERVICE POST Connectors for one or more conductors; many types.

SERVICE ENTRANCE Connectors with extruded copper bodies, Everdur screws.

TELEPHONE Service Connectors, brass rod—plain, nickel plated or tinned.

AND THOUSANDS MORE. Every connector Dependable. Preferred by leading utilities and "industrials," and manufacturers of electrical equipment.
Write for Catalog.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

More Gossip

Baltimore Branch

Charles F. Zweifel & Co., Inc., electrical contractors of New York City, have opened a branch office in the Kayser Bldg., Baltimore, Md. A. C. Brueckmann, formerly of the Brueckmann Electric Co., of the same address is the district manager. H. H. Reger is the district engineer.

Burlington Adopts Electrical Ordinance

The City of Burlington, Vermont, recently adopted two ordinances affecting electrical work. The first is a local ordinance licensing everyone engaged in any form of electrical wiring work. Employees of local public utilities are not included.

The second ruling requires the issuance of a permit, by Wire Inspector A. A. Piche, before any wiring job can be started. Emergency work is excepted.

Nominal annual fees of $2.50 for individuals and $5.00 for firms and corporations holding certificates are charged. Both measures are a step toward the assurance of safe electrical installations.

Inspection Permanency

G. E. Kimball, San Francisco, president of the International Association of Electrical Inspectors, revealed that the majority of electrical inspectors in California are under Civil Service and hence are not affected by changes in political administrations. It's just one more step toward assuring the public qualified inspection service.

***MOTOR SPECIALIST** C. H. Scheidt, shop superintendent of Roland Electric Co., Baltimore, is a busy man these days. He is so tied up with shipyard motor repairs that he had to temporarily shelve shop improvement ideas. However, what little spare time he has goes into their development.*

Analyze Local Code

Headed by Fred Geiss, president of the Greater City Chapter, NECA, a committee representing all Kansas City industry groups is analyzing the recently revised local electrical code.

The procedure being followed is to have the local industry first agree on the new code, as is, or amended; then submit it to other interested groups before taking steps to turn it over to the city for recommended adoption. The code is based on the current edition of N.E.C. with certain additional requirements for Kansas City.

The group now reviewing the code includes F. Geiss, J. F. Costelow, J. Meara, E. L. Coffman, J. A. Ekstrom, E. R. Yonkers, S. W. Fries, H. H. Loving, R. Bettis, M. A. Havenhill, W. Bott, A. Harvey and W. C. Bryant.

Cumming Now Cooking Engineer

A. Ray Cumming, formerly head of the Cumming Electric Co., contractors in Houlton, Me., and for the past seven years commercial cooking specialist with the Public Service Co. of New Hampshire, has been appointed commercial cooking engineer for the United Illuminating Co., New Haven, Conn.

Cheap Vises

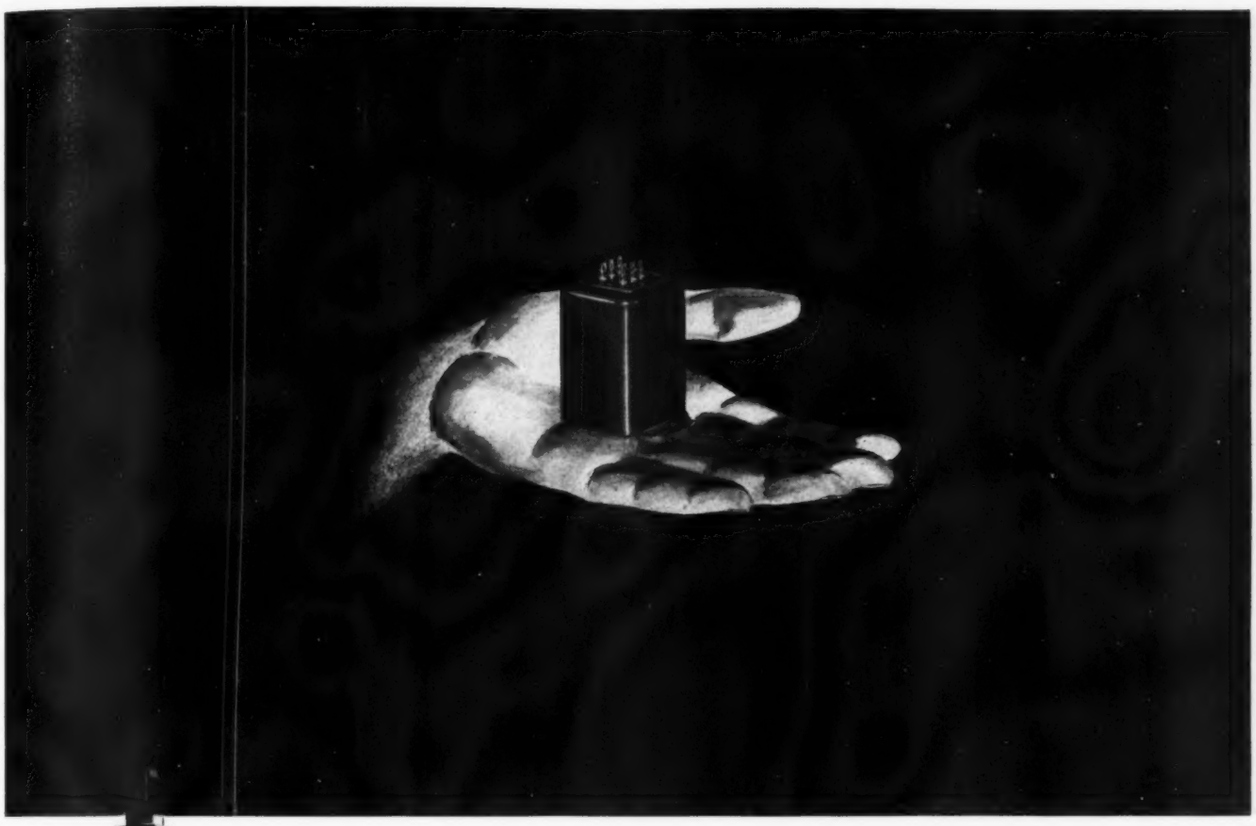
Whether a pipe vise is expensive or cheap depends more on where it is located on the job than the price on the invoice. E. S. Disbrow of the Tri City Electric Co., Hammond, Ind. insists on plenty of vises and stocks well distributed around the job to avoid the "pine bench bottleneck". A few extra tools doing less than 100 percent duty is better than expensive lost time.

Larger Quarters

Herbert G. Martin, Inc., electrical contractors, formerly of 36 Hudson St., Yonkers, N. Y., recently moved to larger quarters at 77 Hawthorne St., in the same city. The new location occupies 5,000 square feet of ground floor space. The rear of the building houses the engineering department and offices with the shop and stock room in front.

League Boosts Membership

An aggressive August membership campaign netted 42 new individual and firm members for the Rocky Mountain Electric League, Denver, rounding up all of the manufacturers and distributors and most of the contractors and dealers in the area. The drive was directed by Campaign Chairman Herb Names and Team Captains E. M. Rowland and C. M. Pearson. A chapter comprising practically every dealer, contractor and utility in Sterling, Colo. was also formed and affiliated with the League.



LITTLE THINGS

that a Battleship's Life Depends On

★ ★ ★ Require the Most in Precision

Absolute dependability at all times and under the most severe conditions is required of all parts that go into the making of a battleship — the most important single unit of our first line of defense.

All important to a battleship is its nervous system, a complex masterpiece of electrical communications and controls upon which the safety of thousands of lives and the efficiency of millions of dollars worth of fighting equipment depend.

The Chicago Transformer Corporation is proud of its ability to furnish parts in keeping with the tradition of excellence and precision required of units that make up the world's mightiest fighting machine—The American Battleship.

CHICAGO TRANSFORMER

CHICAGO TRANSFORMER
CORPORATION
3501 WEST ADDISON STREET • CHICAGO

EQUIPMENT News

Fluorescent Troffer

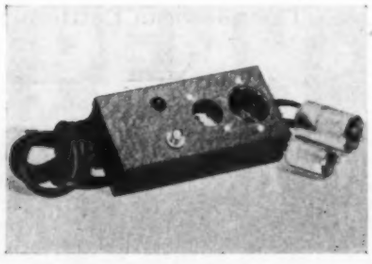
These new louver-type exposed troffers for direct ceiling mounting are designed for single unit installations and long continuous runs. They are available for one and two 48-in. 40-watt lamps parallel and for one 60-in. 100-watt lamp. Louvers are removable. Fixture-body and louvers are finished in baked "super white" enamel. Units are designed for easy installation and serving and provide a high over-all illumination efficiency with minimized direct glare from the lamps. The long ceiling canopy houses auxiliary equipment and acts as a wiring trough. Units are suitable for office, plant and factory application. Day-Brite Lighting, Inc., 5411 Bulwer Avenue, St. Louis, Mo.

DAY-BRITE TROFFER

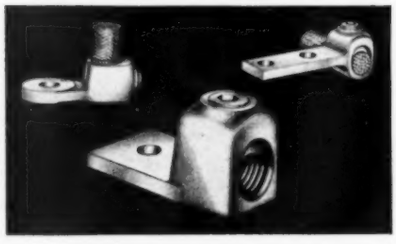
■

Instrument

With this fluorescent tester, fixtures, bulbs, starters and ballasts may be tested to determine cause of failure. It tells which of several component parts needs replacement. All size lamps may be tested from 15 to 100 watts, as well as starters and ballasts for the different wattage lamps. The size of the instrument is 5¼- by 2½- by 1⅜-in. Mitchell Manufacturing Company, 2525 Clybourn Avenue, Chicago, Ill.



MITCHELL FLUORESCENT TESTER



PENN-UNION TERMINAL LUGS

Terminal Lugs

The standard line of Penn-Union Vi-Tite terminal lugs now includes every variety of flange that is regularly specified. The range of sizes is from No. 8 to 1,000,000 cm. Flanges include round and square with one or more bolts. Straight or angle, or side-formed. There are no loose parts. Insert the conductor and tighten with socket wrench. Conductor is held securely as lug is self-locking. Penn-Union Electric Corporation, Erie, Pa.

■

IDEAL LO-VOLT TRANSFORMER

Transformer

This Lo-Volt transformer is a safety device when using electrical extensions in damp, all metal or hazardous locations. It is comprised of a step down transformer that is plugged in between power supply and extension to reduce extension voltage to 6 volts. It has a 10-ft. three-conductor cord. Capacity is 50 watts with a 25-ft. extension. Available for 110 volts, 50–60 cycle or 25 cycle a.c. Size is 2⅞-in. by 3¾-in. by 4-in. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.

G. E. DEFENSE LIGHT

Defense Light

The new Form 79-VR Novalux luminaire is designed for protective fence lighting applications. Principal features are deep shading type reflector and Vertilateral bowl refractor providing vertical and lateral control of light. Unit provides high level illumination while maintaining protective shading for patroling guards. Luminaire has a cast iron hood and has spun-sealed construction making the refractor a permanent part of fixture. General Electric Company, Schenectady, N. Y.

■

Instrument

This new type of megommeter, B-5 Megohmer, simplifies insulation testing and was developed for plant maintenance men. It covers a range of 0–200 megohms for insulation tests, 0–2000 ohms for low resistance measurements and has two d.c. voltmeter scales 0–300 and 0–600 volts. Some of the advantages are—instrument is self-contained, has steady test voltage of 500 volts d.c., has sensitive movement, mirror scale, knife-edged pointer and triple color grading scale feature, which classifies insulation as good, fair and doubtful. It is recommended for insulation resistance measurements of wires and cables; motors and generators; switches, switchboards, panelboards, receptacles, fixtures; fire alarm telegraph systems. Herman H. Sticht Co., Inc., 27 Park Place, New York.

STICHT MEGOHMER

Wiring Capacity Greater in Modern PORCELAIN PROTECTED WIRING...

★ **Code tables allow maximum current capacity ratings, for wires installed in porcelain protected systems.**

BULLETIN

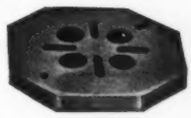
Defense Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for defense needs.

The full use of the insulation characteristics of types RP and RH wires is available only with modern porcelain protected wiring. There is no enclosure to restrict ventilation or to permit temperatures destructive to insulation. Consequently code tables allow higher approved current carrying capacity with perfect safety.

Additional current capacity is only one of the important advantages gained by using modern wires in porcelain protected systems. Operating temperatures above ambient are lower through the whole range up to full capacity which means longer insulation life. Porcelain protected wiring also provides additional insulation of electrical porcelain giving greater safety.

Demands for metals to meet national defense needs are cutting down available supplies of copper. That means that every pound must be used to the best advantage consistent with sound engineering and safe practice.

Without compromise with safety wire installed in Modern Porcelain Protected Wiring system permits heavier loads. To get the most out of wire specify and install Modern Porcelain Protected Wiring systems.



Comparison of Allowable Current Carrying Capacities in ampere of conductor free in air as used on Porcelain Protected Systems and in raceways.

Size	Type R Porcelain Protected	Type R In Raceway	Type RP P.P.	Type RP Raceway	Type RH P.P.	Type RH Raceway
14	20	15	24	18	29	22
12	26	20	31	23	37	27
10	35	25	42	31	50	37
8	48	35	58	41	69	49
6	65	45	78	54	94	65
4	87	60	105	72	125	86
2	118	80	142	96	170	115
1	136	91	164	110	196	131

Reference, National Electrical Code, 1940, Chapter 10, Tables 1 and 2

Manufactured by:

Knox Porcelain Corporation
Knoxville, Tennessee

Illinois Electric Porcelain Company
Macomb, Illinois

Porcelain Products, Incorporated
Findlay, Ohio

and obtainable through your electrical wholesaler.

ADVERTISEMENT

Sturtevant

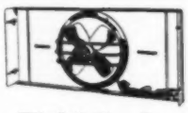
Puts Air to Work

Sturtevant Design 7 Propeller Fan
Made in sizes 12" to 45" inclusive
Capacities
—680 to 15,450 c.f.m.
Direct connected motors
A V. Propeller Fans also available with belt drive

Atticvane Fan

Pressure Blower

Ventilating Set



Wind-O-Vane Fan

Wallvane Fan

STOCKS CARRIED AT MANY POINTS

B. F. STURTEVANT COMPANY
Hyde Park, Boston, Mass. *Branches in 40 cities*

DISTRIBUTOR FOR SOUTHEAST:
NOLAND COMPANY, INC.
Virginia South Carolina District of Columbia
North Carolina Maryland Georgia Alabama

EVERY BATHROOM NEEDS THIS *Extra HEAT*

You need this bathroom heat every day in the year. When it's too warm for unit heat or too cold for unit heat alone—Thermador Built-In Bathroom Heaters are the answer. Just a flip of the switch and you are instantly blanketed in flameless, fumeless electric warmth.

THERMADOR ELECTRIC BATHROOM HEATERS

THERMADOR ELECTRICAL MFG. CO.
5119 So. Riverside Dr., Dept. EC 11
Los Angeles, California

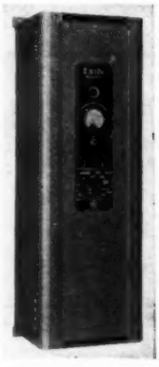
Gentlemen:
Please send me complete contractors specifications and prices.

Name_____
Street_____
City_____ State_____

EQUIPMENT *News* [FROM PAGE 126]

Emergency Lighting Systems

Four new Exide emergency light and power units for industrial use have been developed. Each unit is equipped with either chloride or flat plate type battery. Units have automatic transfer switch which transfers battery to emergency lighting circuit upon failure of a.c. supply. When a.c. service is restored, emergency lighting circuits are transferred back to a.c. supply. Battery is kept fully charged at all times. The new units, available in capacities of from 3400 to 10,000 watts, are adapted to industrial plants where interruption of normal source of power may result in harm or damage. Other systems are available in capacities ranging from 240 to 100,000 watts. The Electric Storage Battery Co., 19th St. & Allegheny Ave., Philadelphia, Pa.

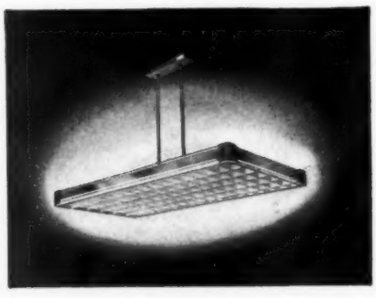


EXIDE EMERGENCY UNIT

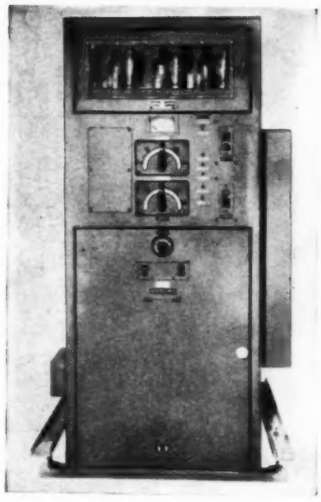
■

Fluorescent Lighting

This new fluorescent lighting unit is called The Ace and is for commercial use. It uses four or six 40-watt lamps and is for operation on 110 volt, 60 cycle, alternating current. Direct view of lamps are concealed by louvers. Lamp replacement is made by lowering hinged louvers. It can be interconnected on factory order to form continuous luminaires. Most of the light is directed downward but there is a small indirect component to light ceiling area. The F. W. Wakefield Brass Company, Vermilion, Ohio.



WAKEFIELD ACE

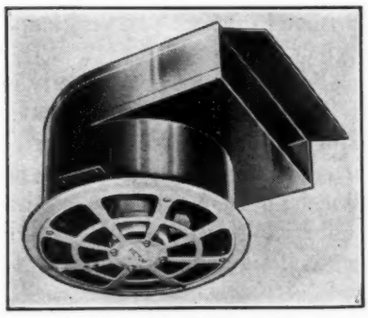


G. E. WELDER CONTROL

Welder Control

A new capacitor discharge control designed for use with stored-energy type resistance welding machines. Control cabinet contains up to 22 capacitors. Two tap switches select number of capacitors desired in one-unit steps, each 120 mfd. Special circuit prevents operation of welder if capacitor voltage is more than three per cent below its preselected value. Control is enclosed in a compact steel floor-mounted case, 8-ft. 8-in. high, 4-ft. 3½-in. wide and 3-ft. 4½-in. deep. Front of case is in three sections housing rectifier tubes and their controls, control dials and voltmeter, sequence control panel and voltage potentiometer. Control contains a blower in case and several safety devices.

■



VICTOR CEILING VENTILATOR

Ventilator

This new ceiling ventilator unit is called VS 50-U and is for home use. It requires a ceiling opening of 11¼-in. in diameter, an outside wall opening of 12¼-in. by 3⅞-in. and can be installed in any ceiling that has an air duct between floors. Two self-acting louvers open and close automatically with starting and stopping of fan. Louvers have weathertight sealing. One of them is placed at end of fan housing and the other is used in outside wall hood. Victor Electric Products, Inc., 2950 Robertson Ave., Cincinnati, Ohio.

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Cable to 2 1/8" (with Bushings)

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MINERALLAC JIFFY CLIP

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MINERALLAC ELECTRIC CO.
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BETTER FLUORESCENT LAMP PERFORMANCE

WITH **ACME FLUORESCENT BALLASTS**

Compare the performance of an Acme powered fluorescent unit. You'll see how Acme's balanced design of equalized secondary voltage provides for equalized light output from each lamp—no flickering. And, notice too that Acme ballasts are quiet. Noise-insulated to prevent unnecessary magnetic hum and vibration.

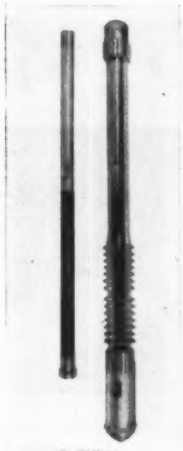
In manufacturing, selling and installing fluorescent fixtures, quality does effect profits. Specify ACME Fluorescent Ballasts. Write for Bulletin.

THE ACME ELECTRIC & MFG. CO.
36 WATER STREET • • • CUBA, N. Y.

Acme ACME Electric
TRANSFORMERS

Power Fuse

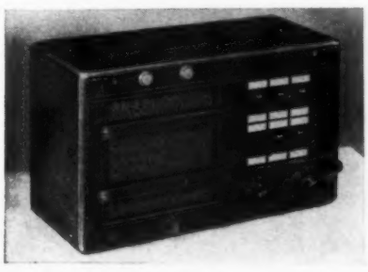
The Type SMG power fuse for high voltage service has been added to this line. It provides increased interrupting capacities in voltage range from 66 to 132 kv. It is designed for application on high-voltage sides of stepdown substations, at sectionalizing points on transmission lines and at other points where short circuit energies may be high and fast. Short-circuit interrupting ratings range from 9,000 amperes r.m.s. for the 46 kv. fuse to 5,000 amperes for the 132 kv. fuse. A field-replaceable fusible element assembly is housed in Pyrex glass tube corrugated at upper end and condenser at vent for confining gas discharge. Schweitzer & Conrad, Inc., 4435 Ravenswood Ave., Chicago, Ill.



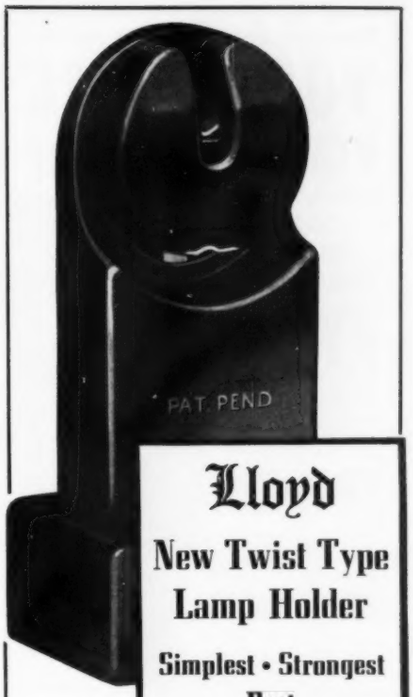
S & C POWER FUSE

Loudspeaker-Telephones

These loudspeaker-telephones are designed for every type of business; industrial; professional and governmental organizations. It is available with two to 36 two-way inter-communicating units, with or without additional loudspeaking and paging sub-stations. Additional units may be added at any time. Electric power is required at master stations and permits controlled operation of any part of the system as required. Master stations may receive and reply by voice without manual operation even when person called has forgotten to turn on current. Remler Company, Ltd., 19th at Bryant Streets, San Frisco, Calif.



REMLER LOUDSPEAKER TELEPHONES



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Pats. Pend.

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- Place one lamp terminal pin in slot. Twist—click—it's locked in **positive contact.** A half-turn in either direction does it.
- No strain on pins or casing.
- A tempered steel spring more than doubles strength of lock with no loss of flexibility. No jolt or vibration can loosen lamp.

Black—Cat. 351 Black Combination with Starter Socket Cat. 353

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Cat. 252
With "Lobster Claw"
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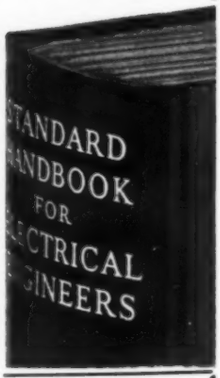

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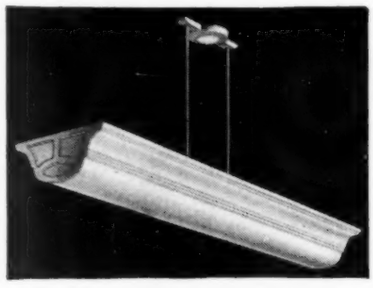
EQUIPMENT NEWS

[FROM PAGE 129]

Indirect Fluorescent Unit

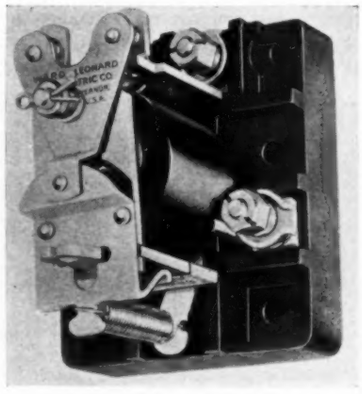
The indirect Flu-O-Flector unit is a new luminaire designed to provide indirect lighting with fluorescent lamps. Specially designed reflector provides broad light distribution, eliminating "hot spot" of light directly above fixture and permitting wider spacings and use in low ceiling areas. Unit has a "300° white" inner reflector and ornamental ends. Lower bottom of fixture basin is easily removable for installation and maintenance convenience. Units are available for two 40, 65 or 100 watt lamps; with single or double stem hangers. Fixtures can be mounted individually or in continuous rows without use of extra parts. Edwin F. Guth Company, 2615 Washington Blvd., St. Louis, Mo.



GUTH INDIRECT FLU-O-FLECTOR

Relays

Bulletin 106 relays have been improved in construction details and materials. They are furnished with molded bakelite base providing protection against absorption of moisture, higher insulating qualities, increased mechanical strength and lighter weight. All double-pole relays have rubber insulated lead wires. On double-pole, double-throw relays, the contacts carried by bakelite arm are secured by a spun over riveting operation that requires no facing and eliminating open end grain contact. Are available for use on either a.c. or d.c. Ward Leonard Electric Co., 31 South Street, Mount Vernon, N. Y.



WARD LEONARD RELAY

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Synchronous
ELECTRIC TIME SWITCHES

CONTRACTORS LIKE THEM BECAUSE: they are dependable and easy to install

USERS LIKE THEM BECAUSE: of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
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KRUEGER & HUDEPOHL
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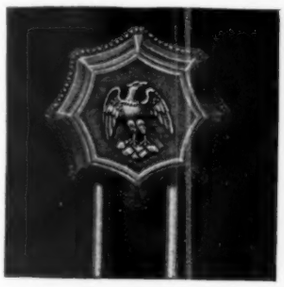
Door Chimes

This new line of door chimes has been designed for permanency. The shields are made of Sylvite, a new wood composition. They claim it will not mar or crack and permits reproduction of old wood carvings. Available in a variety of finishes, such as Early American maple, pickled pine, antiqued mahogany, and oyster white. Oversized symphonic tubes give depth and resonance of tone. The tone of each tube is controlled by a plastic symphonic modulator. Edwards and Company, Norwalk, Conn.

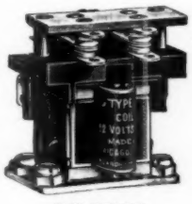


EDWARDS DOOR CHIME

■

Relay

The Type "J" relay, which is small in size, has been added to this line. It is suitable for use at high altitudes and designed to withstand aircraft vibration, high acceleration and high humidity. It has two poles and self cleaning contacts. The overall dimensions are 1⅞-in. high, 1 9/16-in. long, and 1⅝-in. wide. Coils are designed for operation on direct current. G-M Laboratories, Inc., 1735 Belmont Avenue, Chicago, Ill.

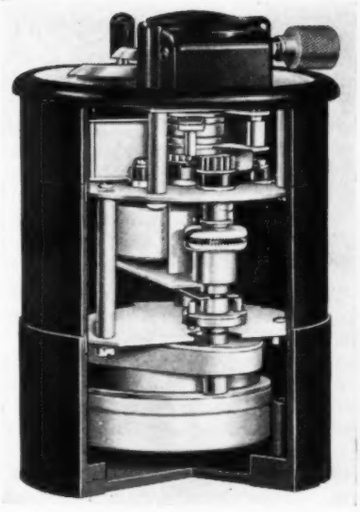


G-M RELAY

■

Fluorescent Lamp Starter

An improved starter device for 40-watt mazda fluorescent lamps has been developed. It includes a "stopper" element that shuts off starter element if lamp has reached the end of its normal life. Device is included in same small cylindrical container that is standard for conventional starters. It is interchangeable with present units. Device is designed to permit more efficient and economical group replacement without flickering of inoperative tubes, between service periods, as well as to protect starters from wear. General Electric Company, Bridgeport, Conn.



CRAMER TIME RELAY

Time Relays

The new time relays, Type RS1C and TD1C, are synchronous motor operated timers, which either keep an electrical circuit closed for a preset time interval or can be used as time delay relays which keep a circuit open for a selected interval. Timers have instantaneous reset feature and when restarted repeat the timing without manual resetting. They are available with inbuilt manual start button or can be supplied for remote control start button. Auxiliary contacts can be furnished for audible or visual signal circuits. It is for use on all kinds of machinery or industrial process which must be time controlled or for electrical circuits where time delay action is required. The main switch unit is rated 10 ampere, 115 volt or 5 ampere 220 volt or 3 ampere 440 volt a.c. R. W. Cramer Company, Inc., Centerbrook, Conn.

■

MARKEL STREAMLITE FIXTURE

Enclosed Fluorescent Fixture

The new "Streamlite" fixture is a fluorescent unit toally enclosed in glass. Translucent sides are finished in bone white for soft shaded light in normal line of vision. Top and bottom are of clear ribbed glass for maximum light on ceiling and working plane. Glass comes in sections that slide easily onto fixture chassis and lock in place for easy maintenance. Units available for two 20, 40 or 100 watt lamps and four 20 or 40 watt lamps; for ceiling or suspension mounting. For use on 60 cycle, 110/125 volt a.c. only. Fixtures are furnished completely wired. Markel Electric Products, Inc., 145 East Seneca St., Buffalo, N. Y.

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- TUBE BENDERS
- KNOCKOUT TOOLS
- CABLE PULLERS
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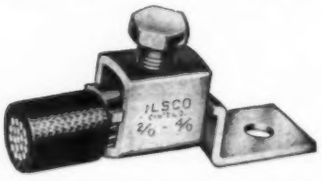

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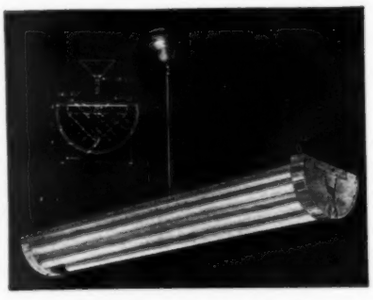
5629 MADISON ROAD — CIN., O.

EQUIPMENT News

[FROM PAGE 131]

Fluorescent Fixture

The Cup unit is a fluorescent fixture designed for all general lighting purposes. Unit is suspended on 24-inch stems or flush from ceiling. When suspended on stem and canopy, unit is self aligning due to swivel furnished at base of canopy. All reflecting surfaces are finished in "Plastox" white. Contours of reflecting surface are designed to give a spread of 180 degrees below horizontal, and 90 degrees above. Unit has onyx plastic ends. Fixture is 49½-in. long, 9-in. wide, and 5½-in. deep. The Spero Electric Corporation, 18222 Lanken Avenue, Cleveland, Ohio.

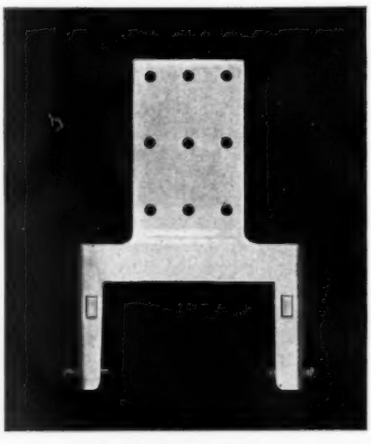


SPERO COMMERCIAL FIXTURE

■

Switch Box Bracket

This bracket takes any standard switch box of any depth for conduit, flexible cable, non-metallic cable or loom. It enables pulling cable in before placing outlet boxes. It allows for removing of all necessary knockouts before placing the box. Carl. E. Walters, 170 Portage Street, Kalamazoo, Mich.



WALTERS BRACKET

Vise Stand

This new heavy-duty Vistand with integral chain vise is portable and designed to prevent tipping or tilting. It has spreads of 50 inches in front and 43 inches from front to rear leg. Platform measures 14 inches in both width and depth and has notches and slots for tools around rim. It is also equipped with three benders—one for ¾-in. pipe and reverse benders for ½-in. and ¾-in. pipe—placed over right front leg. Armstrong Mfg. Co., Bridgeport, Conn.

ARMSTRONG VISE STAND

■

Lighting Plants

This new line of light and power plants includes models for 600, 1000, 1500 and 2000 watts. Generators are of self-excited, single phase type, generating 110-volts, 60 cycle a.c. 1800 r.p.m. A source of d.c. may be drawn from d.c. terminals when plant is not carrying full a.c. load. The d.c. is 12 or 32 volts. It has 4 cycle, single cylinder, air-cooled engines; float-feed type, adjustable carburetor; oil-bath type air-cleaner; overhead fuel tank. Available with remote or full automatic control. Kato Engineering Company, 54 Elm Street, Mankato, Minn.

KATO LIGHTING PLANT

■

Lamp Changer

This new lamp changer is fitted with an extension pole that reaches up to 20-ft. It removes or replaces standard lamp bulbs from stationary sockets where bulbs are not entirely surrounded by globes or wire protection. It grips bulbs suspended on pipes as well as those in ceiling sockets. It consists of a rubber suction cup mounted on one end of a pole. Grip of suction cup is obtained by pushing it against bottom of bulb and released by pulling a cord attached to lip of cup. Lamp changers are available with 4- and 7-ft. long poles, also an 8-ft. grooved extension pole. Ideal Commutator Dresser Company, 1041 Park Avenue, Sycamore, Ill.

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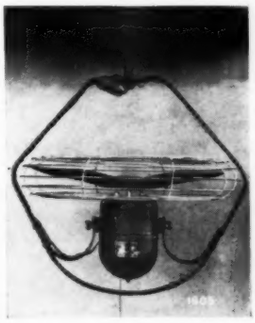
330 West 42nd Street, N. Y. City

Heat Circulator

The Reco heat circulator is a power fan that blows air to ceiling, then down walls and back again, giving complete air circulation in the room and providing uniform temperature. Units are available in permanently installed ceiling types or portable models. Size of blades are 20- or 24-inch. It is claimed to give a reduction in the amount of fuel required to keep the room comfortable. Reynolds Electric Company, 2650 W. Congress St., Chicago, Ill.



REYNOLDS HEAT CIRCULATOR

■

Lamps

Nalco inside-silvered carbon filament lamps have been developed for infra-red ray processes in drying, baking, heating and dehydrating. Silver in base end of lamp acts as reflector to project infra-red rays toward surface being worked on. Available in model R-40, 250 watts, 110-120 volts. Clear glass infra-red lamps available in model PS-30 and G-25. Clear glass types require separate reflectors which can be furnished in gold-plated or aluminum. North American Electric Lamp Co., 1044 Tyler Street, St. Louis, Mo.

NALCO INSIDE-SILVERED LAMPS

■

Starter Switch

A new "no-blink" starter switch which will shut off a fluorescent lamp when it has reached the stage where it blinks on and off has been developed. It is designed for the 40-watt mazda fluorescent lamp and will eliminate blinking and flickering of burned-out lamps. Starter switches will last longer because they will not be impaired by repeated attempts to start lamps. New switches are interchangeable with present FS-4 two-contact switches for operating 40-watt mazda fluorescent lamps. Westinghouse Electric and Manufacturing Company, Bloomfield, N. J.

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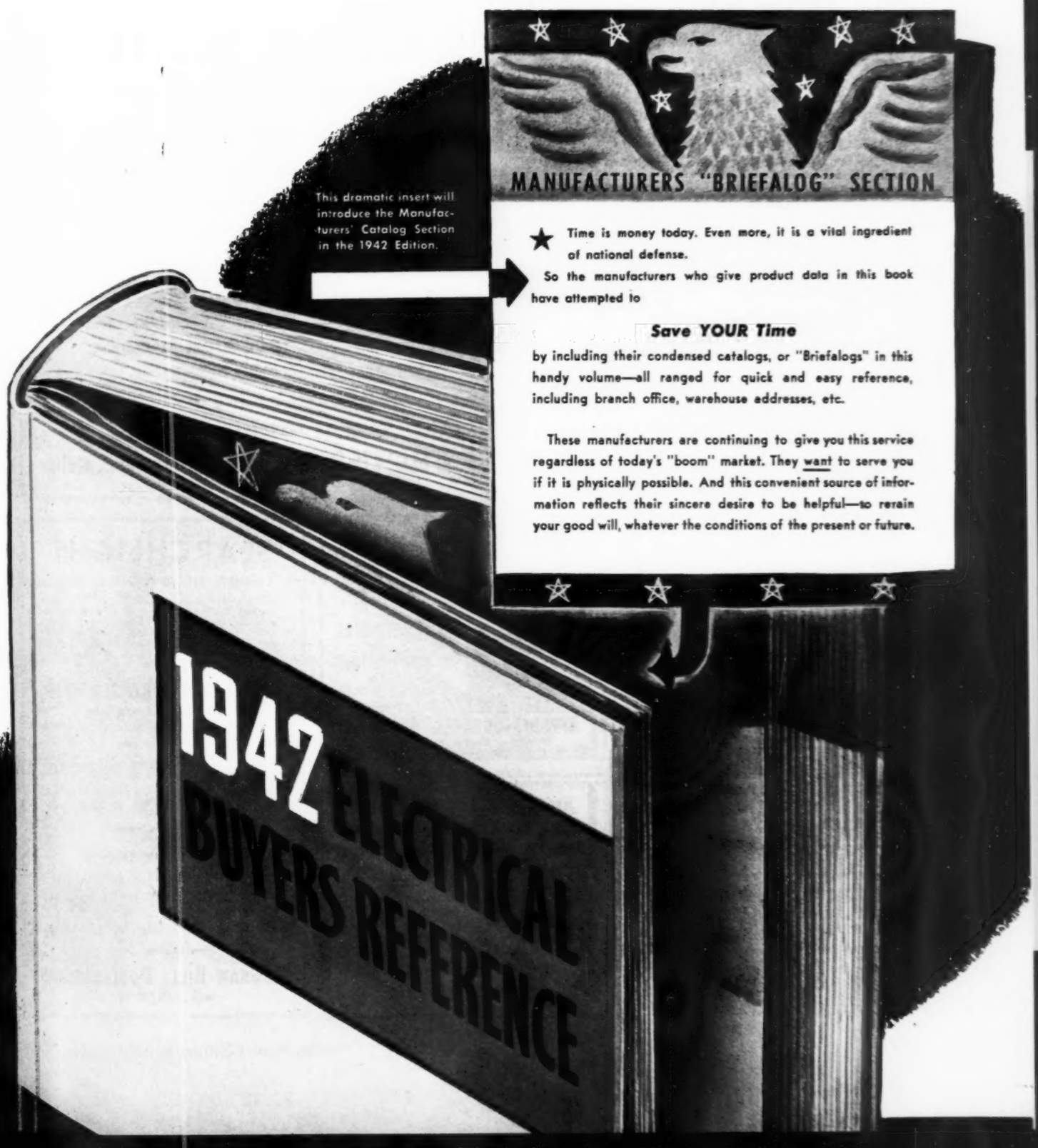
VALUABLE BUYERS' GUIDE


This dramatic insert will introduce the Manufacturers' Catalog Section in the 1942 Edition.
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So the manufacturers who give product data in this book have attempted to
Save YOUR Time
by including their condensed catalogs, or "Briefalogs" in this handy volume—all ranged for quick and easy reference, including branch office, warehouse addresses, etc.
These manufacturers are continuing to give you this service regardless of today's "boom" market. They want to serve you if it is physically possible. And this convenient source of information reflects their sincere desire to be helpful—to retain your good will, whatever the conditions of the present or future.
1942 ELECTRICAL BUYERS REFERENCE

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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15 cents a word, minimum charge $3.00.
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POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.
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PURCHASING: Man, 40, fifteen years experience in electrical jobbing business, buying, merchandising, stock control desires a change. Will take part interest. Write PW-26, Electrical Contracting, 520 N. Michigan Ave., Chicago, Ill.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Electrical Contracting, published monthly at Albany, N. Y., for October 1, 1941.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared D. C. McGraw, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical Contracting, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Editor, Earl Whiteborne, 330 West 42nd St., N. Y. C. Managing Editor, None. Business Manager, W. K. Beard, Jr. 330 West 42nd St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42nd St., N. Y. C. James H. McGraw, Jr., 330 West 42nd St., N. Y. C. James H. McGraw, James H. McGraw, Jr., and Curtis W. McGraw, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw, 330 West 42nd St., N. Y. C. Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd., Madison, N. J., Curtis W. McGraw, 330 West 42nd St., N. Y. C. Donald C. McGraw, 330 West 42nd St., N. Y. C. Anne Hugus Britton, 330 West 42nd St., N. Y. C. Mildred W. McGraw, Madison, N. J. Grace W. Mehren, 73 No. Country Club Drive, Phoenix, Ariz. J. Malcolm Muir & Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 140 Broadway, N. Y. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is. (This information is required from daily publications only.)

D. C. McGRAW, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.
Sworn to and subscribed before me this 29th day of September, 1941.
[SEAL] H. E. BEIRNE,

Notary Public, Nassau County. Clk's No. 93, N. Y. Clk's No. 974, Reg. No 2-B-609.
(My commission expires March 30, 1942)

FOR IMMEDIATE DELIVERY!

Used Electrical Equipment

ALL TYPES AND SIZES

47 Ammeters
20 Regulators
517 Disconnecting Switches
330 Bus Supports
161 Current Transformers
23 Potential Transformers
125 Switchboard Fittings
3 Voltmeters
393 Wattmeters & Watt Hour Meters
23 Cable Terminals
74 Cut Outs
5 Power Transformers
20 Bus Bar
75 Oil Circuit Breakers

425 Other Miscellaneous Items

Write TODAY for listing of Complete Inventory

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OIL SWITCHES
AIR CIRCUIT BREAKERS
TRANSFORMERS
COMPENSATORS
BOUGHT—SOLD

CIRCUIT BREAKER COMPANY
Division of Electric Equipment Co.
347 N. CLINTON AVE. ROCHESTER, N. Y.

ANOTHER OPPORTUNITY FOR ELECTRICAL DEALERS

You can buy completely overhauled and performance tested electric motors, generators, transformers, MG sets, welders, platers, etc., from Moreco and *Resell* at competitive prices and still make plenty profit. Send us your inquiries. We co-operate with dealers.

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Departmental Staff

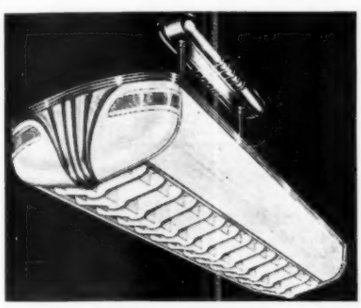
McGRAW-HILL PUBLICATIONS
New York, N. Y.

EQUIPMENT NEWS

[FROM PAGE 133]

Louvered Fluorescent Fixture

This new fluorescent fixture is known as "Louvered Day-Lume." Moulded plastic ends give two-tone appearance blending with plastic side panels. Louvers provide shielding and well diffused, shadowless direct light. Side rails and louvers are finished in baked "super white" enamel. Units are designed for four to eight 48-in. or 60-in. lamps. Available in either ceiling or suspension mounting. Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis, Mo.

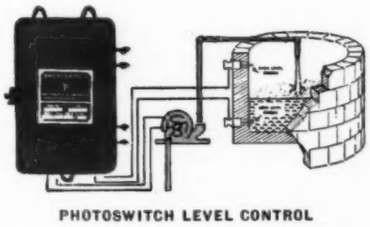


DAY-BRITE DAY-LUME UNIT

■

Electronic Control

The electronic level control Series P16 provides on and off valve or pump control of any liquid. It is used for control of water, milk, nitrates, sulphates, alcohol, distilled water, refrigerants, gasoline, etc. Available for single level indication and control, on and off pump-up and pump-down control at two levels, boiler feedwater control and low level safeguards. Probe fittings have been designed for high and low pressure and temperature requirements. Probes or electrodes are attached to tank at levels representing low point where pumping starts and high level where pumping stops. They are wired to level control. When liquid level falls below lower probe, level control starts pump in operation. When level rises to upper probe, fluid acts as conductor of small amount of current required for operation of level control which stops the pump. Photoswitch Incorporated, 21 Chestnut Street, Cambridge, Mass.



PHOTOSWITCH LEVEL CONTROL

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

UNDERWRITERS' APPROVED

3 A G LITTELFUSES

Slo-Blo · Standard · Sleeve Type

Replaces large and bulky cartridge type fuses and their bulky mountings. Space savers. 16 sizes—ratings from 1/100 to 8 amps., 250 volts. All Underwriters' Approved. Write for catalog.

LITTELFUSE, INC.
4789 N. Ravenswood Ave. Chicago, Ill.

TEST-O-LITE

Tests Everything Electrical From 100 to 550 Volts

APPLIANCES · MOTORS · FUSES

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.

Only TEST-O-LITE, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also.

List $1.50 at leading jobbers.

L. S. BRACH MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.

Electric Operators For Any Overhead Type Door

DOORS AND OPERATORS INC.
See page 309 Elec. Byrs. Ref. · TIFFIN, OHIO

Low Cost! ZENITH MAGNETIC CONTACTORS Quick Delivery

Electrically Held—Mechanically Held for all types of installations. Copper to copper contacts with rolling and sliding action. 30 to 600 amps., A.C. and D.C., 1 to 4 poles.

CATALOG. Save money with Zenith Automatic Control Equipment. Catalog free.

ZENITH ELECTRIC CO.
845 S. Wabash Avenue Chicago, Ill.

DRILLS CONCRETE—METAL—WOOD

WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1⅜" dia.; metal to ⅜". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone AUstin 9866

SpeedWay

Complete line of direct and back-geared "Flea Power" Electric Motors, A. C. and D. C.; any voltage. State requirement; 1 or a million on short notice. Catalog Free.

SPEEDWAY MFG. CO.
1866 S. 52nd Ave.
CICERO, ILL.

Over 87½% of the electric Hammers in use are Speedways because Speedways out-perform and outlast all others. Write for circular.

SPEEDWAY MFG. CO.
1866 S. 52nd Ave. CICERO, ILL. SpeedWay

ALLEN Sodering Paste

Fast working — corrosion free. Assures secure electrical and mechanical joints. Triples strength of soder. Underwriters approved listing. Send for free samples.

L. B. ALLEN CO. INC. 6715 Bryn Mawr Ave. Chicago, Illinois

SUPERIOR SERVICE INSULATORS

S-29

Superior Quality Service Knobs and House Brackets

SEND NOW for complete information and price lists.

SUPERIOR PORCELAIN CO.
BOX 669 PARKERSBURG, W. VA

Delivery vs. Delay . . .

When knowing where to find what you need is the deciding factor between DELIVERY and DELAY . . . consult the advertising pages. If they do not tell where to find what you need . . . write

Electrical Contracting

The **RAT-TAN** Man Says:
(Trade Mark Reg.)

"Many modern industrial fixture lighting circuits require No. 12 wire. You can make these connections with

The **MARR No. 2**

—the solderless connector that does the job cheaper and better than with tape, solder and torch."

A perfect joint connector
(Cap made of Bakelite)
—especially adapted for #12 WIRE

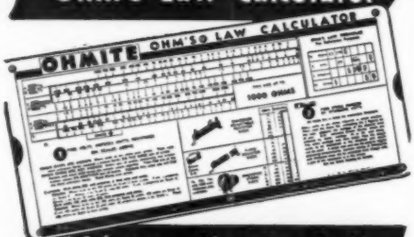
The MARR No. 2 gives you a solid, permanent connection, too. Simply insert the wires, tighten with a screw driver, turn on the Bakelite cap—and you're all set!

Approved by Underwriters

WRITE TODAY FOR FREE SAMPLES!
SEE YOUR ELECTRICAL DEALER.

THE RATTAN MANUFACTURING COMPANY
522 STATE STREET NEW HAVEN, CONN.
GENERAL SALES AGENTS: HATHEWAY AND CO.
75 Montgomery St., Jersey City, N. J., U.S.A.

Everyone Can Use this Handy OHMITE Ohm's Law Calculator



Solves any Ohm's Law Problem with one setting of the slide...

SIMPLE—easy to use. Requires no slide rule knowledge. All values are direct reading. Scales on two sides cover the range of currents, resistances, wattages and voltages commonly used in electrical and radio work. Selector also shows stock number of resistor or rheostat you may need. Size 4⅛" x 9". *Send for it Today. Use this Coupon.*

Only **10c** to Cover Handling Cost

OHMITE MANUFACTURING CO.
4937 Flournoy St., Chicago, U. S. A.
10c in Coin enclosed. Send Ohm's Law Calculator.

Name .....
Address .....
City ..... State .....
Elec. Cont. Nov. '41

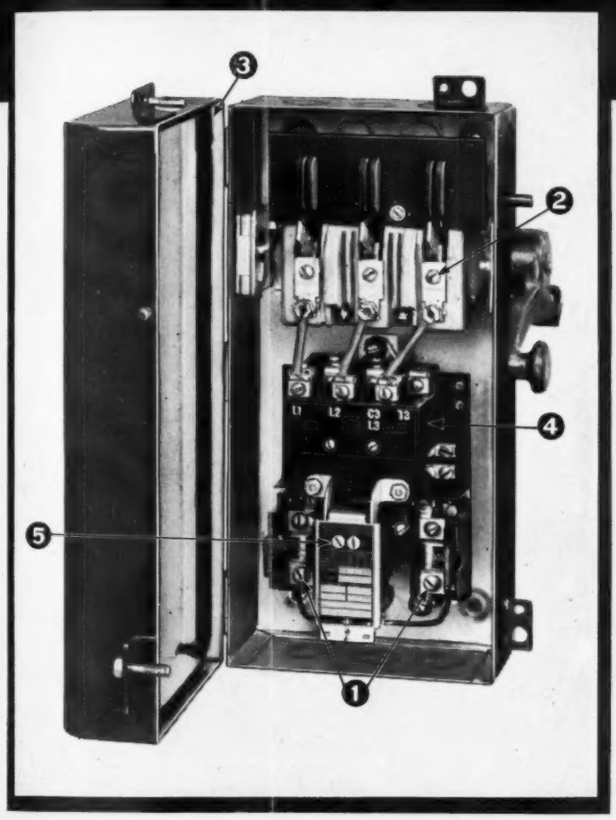
Be Right with **OHMITE**
RHEOSTATS - RESISTORS - TAP SWITCHES

Alphabetical Index to Advertisers

	Page
Acme Electric Mfg. Co.	129
Adam Elec. Co., Frank	87
Allen Co. Inc., L. B.	137
*Allen-Bradley Co.	105, 106
Aluminum Co. of America	12
*American Automatic Elec. Sales Co.	16
American Cyanamid Co., Plastic Div.	89
*American Transformer Co.	80
Anaconda Wire & Cable Co.	34, 35
*Appleton Electric Co.	83
Arrow-Hart & Hegeman Elec. Co.	18
Automatic Elec. Mfg. Co.	121
Beaver Pipe Tools, Inc.	103
*Benjamin Elec. Mfg. Co.	47, 56
Brach Mfg. Corp., L. S.	137
*Briegel Method Tool Co.	92
Bryant Electric Co.	6, 59
BullDog Elec. Prod. Co.	61
Bunting Brass & Bronze Co.	103
Burndy Engineering Co.	109
*Bussmann Mfg. Co.	57
*Carboloy Co., Inc.	104
Century Electric Co.	101
*Chase Shawmut Co.	14
*Chicago Transformer Corp.	125
Circuit Breaker Co.	136
Clark Controller Mfg. Co.	97
Cleveland Switchboard Co.	118
Crescent Ins. Wire & Cable Co.	78
*Curtis Lighting, Inc.	64
*Cutler-Hammer, Inc.	33
*Day Brite Lighting, Inc.	52, 53
Dept. of Utilities	136
*Doors & Operators, Inc.	137
Employment	136
*Fairbanks, Morse & Co.	113
*Fast & Co., John E.	98
*Fibre Conduit Co.	51
Frink Corp.	121
*Fullman Mfg. Co.	120
General Cable Corp.	65
*General Electric Co. (Bridgeport) Back Cover, 72, 84, 85, 91,	117
*General Electric Co. (Nela Park)	40, 41
*General Electric Co. (Schenectady) Second Cover, 10, 11,	111
Goodrich Elec. Co.	42
*Graybar Electric Co.	49, 76
*Greenlee Tool Co.	131
Guth Co., Edw. F.	4
*Hazard Ins. Wire Works Div.	5, 79
Hubbell Inc., Harvey	55
Hygrade-Sylvania Corp.	9
*Ideal Comm. Dresser Co.	118
Ilg Elec. Ventilating Co.	54
*Illinois Electric Porcelain Co.	127, 132
*Ilsco Copper Tube & Products, Inc.	132
Insulation & Wires, Inc.	104
*Irvington Varnish & Ins. Co.	90
*Jefferson Elec. Co.	66
*Johns-Manville Corp.	115
*Johnson Bronze Co.	98
*Klein & Sons, Math.	122
Knox Porcelain Corp.	127
*Krueger & Hudepohl, Inc.	130
Lighting Products, Inc.	116
Littelfuse, Inc.	137
Lloyd Products Co.	129
*McGill Mfg. Co.	119
McGraw Hill Book Co.	120, 130
Metropolitan Device Corp.	1
Miller Co.	45
Minerallac Elec. Co.	129
Mitchell Mfg. Co.	70
Motor Repair & Mfg. Co.	136
Multi Elect. Mfg. Co.	119
National Elec. Products Corp.	69, 104
Ohmite Mfg. Co.	138
Okonite Co.	5, 79
*Overbagh & Ayres Mfg. Co.	114
Owens-Corning Fiberglas Corp.	8
Paine Co., The	102
Paragon Elec. Co.	46
Pass & Seymour, Inc.	123
Peerless Elec. Co.	133
*Penn-Union Elec. Corp.	124
Porcelain Group	127
Porcelain Products, Inc.	127
Pyle National Co.	102
Quadrangle Mfg. Co.	44
*Rattan Mfg. Co.	138
*Reliance Automatic Lighting Co.	130
*Republic Steel Corp.	62, 63
*Ridge Tool Co.	99
*RLM Standards Inst.	43
Robertson Co., H. H.	7
*Sangamo Electric Co.	13
Searchlight Section	136
*Sherman Mfg. Co., H. B.	121
Signal Electric Mfg. Co.	118, 133
Simplex Wire & Cable Co.	74
*Sola Electric Co.	108
Speedway Mfg. Co.	137
Square D Co. Inside Back Cover,	75
*Steel & Tubes Division	62, 63
*Sturtevant Co., B. F.	128
*Superior Carbon Prod. Co.	116
Superior Porcelain Co.	137
*Thermador Elec'l Mfg. Co.	128
*Thomas & Betts Co.	50
*Tork Clock Co.	119
Trico Fuse Mfg. Co.	102
*Trumbull Elec. Mfg. Co.	67
Wakefield Brass Co.	60
*Ward Leonard Elec. Co.	114
Webster Electric Co.	73
*West Dodd Lightning Cond. Corp.	88
*Westinghouse Elec. & Mfg. Co.	2, 3, 39
*Westinghouse Elec. Supply Co.	81
*Weston Elec'l Instr. Corp.	58
*Wheeler Reflector Co.	68
Where To Buy	137
Wodack Elec. Tool Corp.	137
Youngstown Sheet & Tube Co.	71
Zenith Electric Co.	137

★ **These companies have supplied additional buying information on their products in the 1941 edition of the Electrical Buyers' Reference.**

THE OPERATING AND MAINTENANCE ELECTRICIANS VOTED SQUARE D



SQUARE D COMPANY	**98**
COMPANY A	**94**
COMPANY B	**91**
COMPANY C	**91**
COMPANY D	**84**
COMPANY E	**72**
COMPANY F	**71**

● One of the largest automobile plants recently made comparative tests of all makes of magnetic starters. Size 1 combination starters with disconnect switch were used. The tests were made under the supervision of the chief electrician and his assistant. The Starters built by the seven leading manufacturers passed with varying degrees of merit.

The chief electrician, wisely, wanted the independent opinion of the men who actually install, use and repair the electrical equipment. Five of his best men, two from the construction and three from the maintenance department, were asked to examine and rate the seven starters on the basis of (1) overload relays (2) disconnect switch (3) cabinet construction (4) contact mechanism and rupturing capacity and (5) accessibility of parts. The best or equal starter for each feature was scored with 20 points; the others were penalized a relative number of points. The results (as shown in chart above) speak for themselves.

It's the electrician in the factory who knows how control apparatus performs year in and year out. It's his job to inspect it—replace parts when required—above all to avoid costly shut-downs. These plant electricians prefer Square D electrical equipment of all types and kinds.

1 Thermal overload relays of Melting Alloy type. Patented unit construction prevents faulty installation and permits factory test. Units are clearly marked and easily exchanged.

2 Motor circuit switch with quick make and break action, visible blades, line terminal guard and cover safety interlock.

3 Cabinet of heavy gauge sheet steel with felt cover gaskets (NEMA 1A), provisions for padlocking, rounded cover, and baked machine blue enamel finish with aluminum interior.

4 Contact mechanism has straight line, vertical action with double break silver contacts in an enclosed arc chamber to provide high rupturing capacity.

5 Accessibility of parts is accomplished without sacrifice in size. Removal of two screws permits armature assembly and yoke bar to be taken off, exposing all parts for inspection or normal maintenance.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

G-E Wiring Materials for New Wiring—Rewiring—Maintenance

- Complete line
- High quality
- Distributors at all key points in country

Whatever type of job you're handling, you'll find suitable wiring materials in the G-E line. It contains white conduit, black conduit, flexible conduit, E.M.T., Fiberduct, Types R, RP, RH, RW and SN building wires, boxes and fittings, switches, outlets, sockets, plates, etc.

The quality of all G-E wiring materials is high. Only the finest of raw materials are used. Rigid specifications are met in manufacturing. These materials are designed to be used together and are easy to install. They will give long dependable service.

For further information see the nearest G-E Merchandise Distributor or send the coupon below for a catalog.

General Electric Co., Section CDW-18A
Appliance and Merchandise Dept.
Bridgeport, Conn.

Sirs: Please send me the G-E Wiring Materials Catalog, 51-4115

Name..... *Company*.....

Address..... *Title*.....

City..... *State*.....

GENERAL ELECTRIC